

December 1965

# Agriculture

Vol. 33 No. 12

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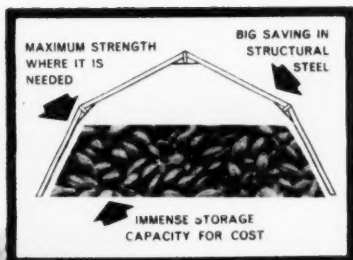
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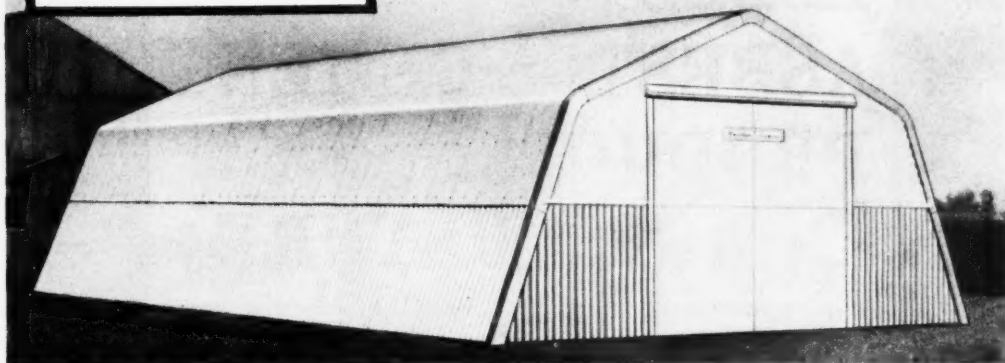
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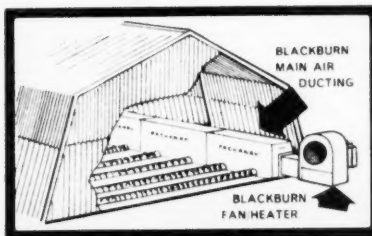
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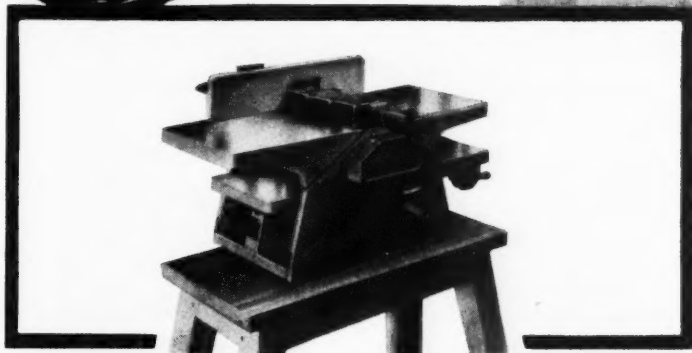


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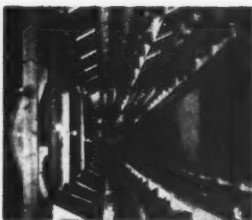
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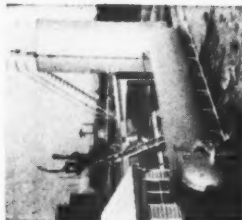
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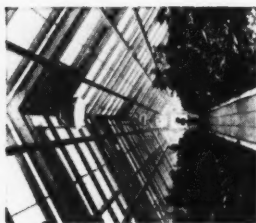
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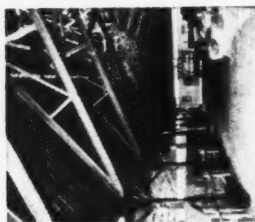
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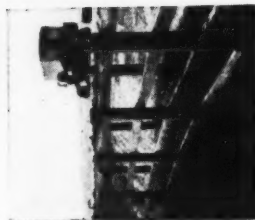
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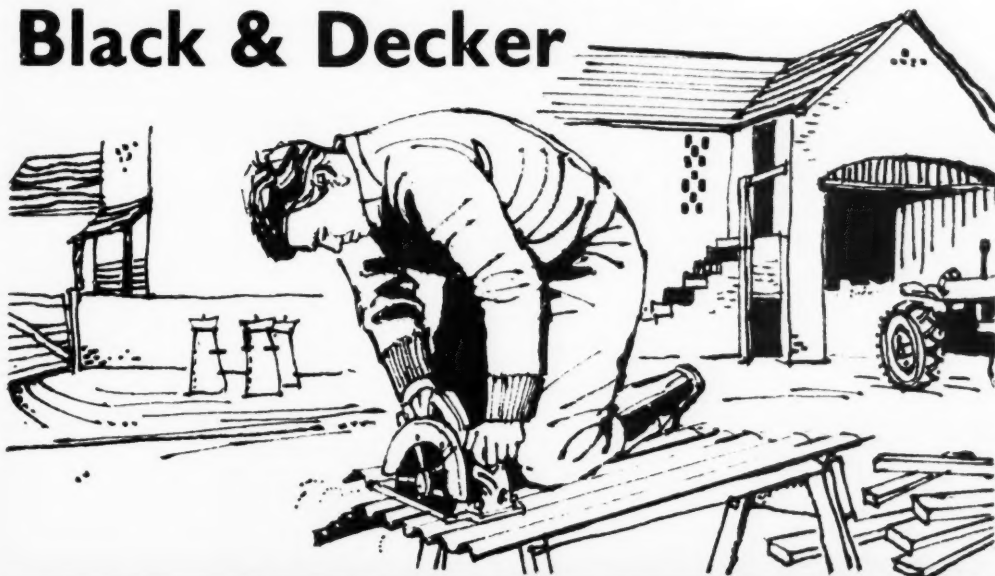
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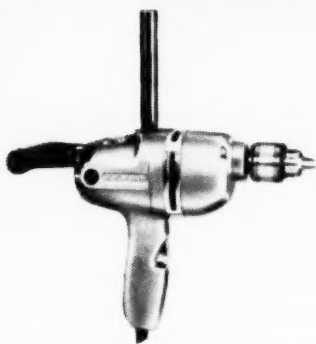
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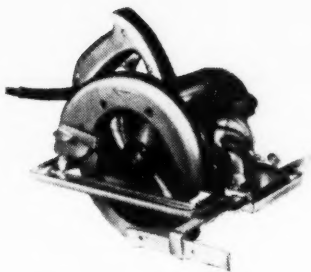


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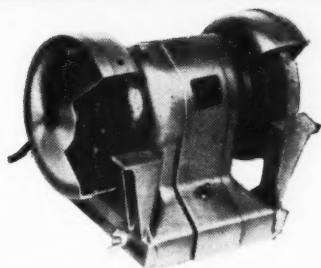
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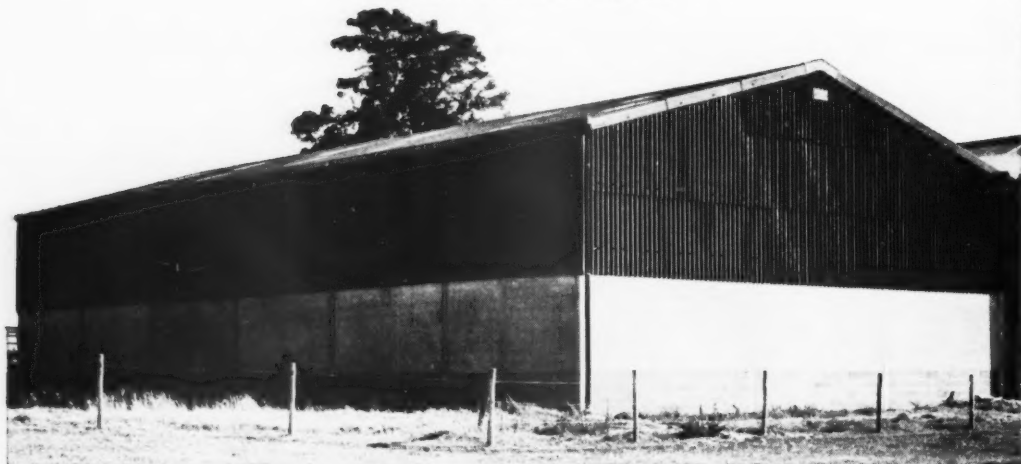
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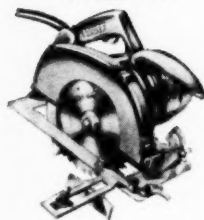
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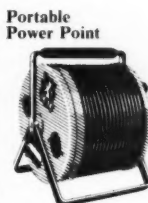
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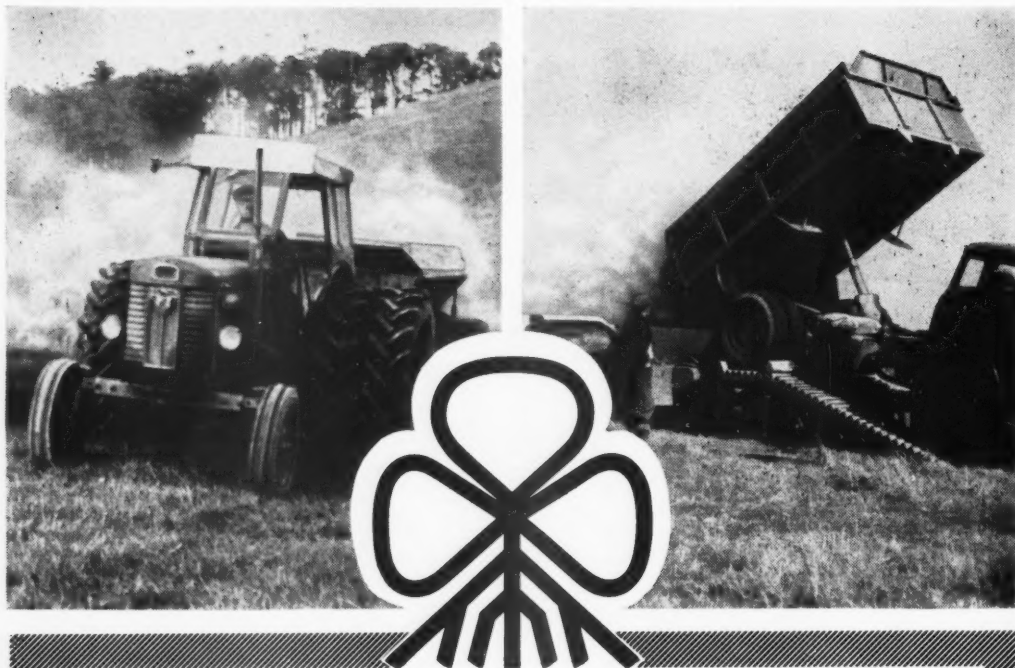


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# Agriculture

VOLUME 72 · NUMBER 12 · DECEMBER 1965

Editorial Offices  
Ministry of Agriculture, Fisheries and Food  
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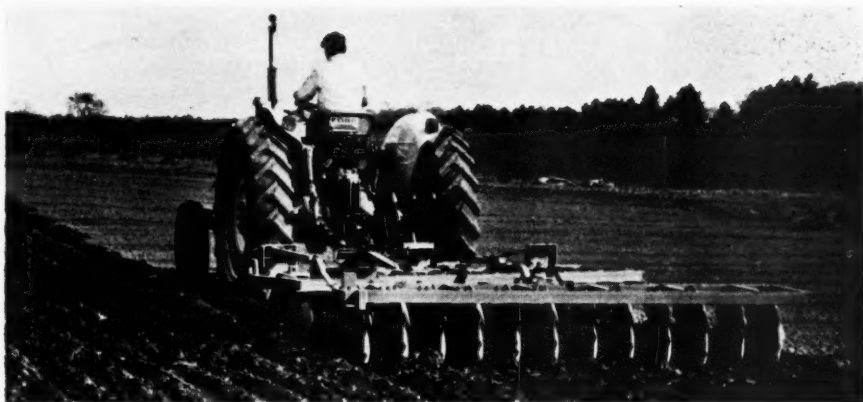
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## Thoughts on Economic Mechanization

THERE are now few British farms which do not require, in greater or lesser degree, the effective application of power and machinery to the everyday tasks. This generalization applies not only to arable farming but also, to a steadily increasing extent, to most branches of livestock husbandry. Increased mechanization naturally has to be paid for, and the additional costs include both higher capital investment and higher running costs.

One way of paying for extra mechanization costs is a reduction in the cost of labour. In the thirties, even on a mainly arable farm, mechanization typically accounted for less than 10 per cent of the total cost of production, compared with about three times as much for labour. Today, typical machinery costs on a similar farm have more than doubled, even after allowing for changes in money values; but the investment in mechanization has enabled the cost of labour to be kept in check, the amount of labour needed having been approximately halved. The recently announced plans for the development of agriculture envisage a continuation of this general trend, but the further the development of mechanization goes, the more difficult it becomes for individual farmers to justify the capital and running costs of extra equipment, especially on small farms where there is only a limited amount of work to be done, and the number of workers cannot be reduced.

One of the essential requirements for higher efficiency is a reasonably high level of machinery utilization. Machines which are potentially efficient cannot adequately contribute to higher productivity if they do only a small proportion of the work of which they are capable. Fortunately, there are several practical solutions of this problem, including machinery syndicates. When a farmer is considering buying new equipment today, a question he might well ask himself is not merely 'can I afford to buy it?' but 'could I use it more economically if I shared it with a neighbour?'

C. CULPIN



## How many Acres per Cow?

J. F. Ormrod

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IN his article in the September, 1965, issue of *Agriculture*, V. H. Beynon pointed out that, in spite of some improvement between 1953 and 1963, we have still a long way to go before we can equal the Netherlands in output from grass. He quoted the relative density of stocking as:

*Acres per cow equivalent*

<i>United Kingdom</i>		<i>Netherlands</i>
<i>1953</i>	<i>1963</i>	<i>1963</i>
1.86	1.63	1.15

The recently-published provisional figures for the June, 1965, agricultural returns for England and Wales show a marked increase in stocking density in the last two years. There was a reduction in acres per cow equivalent of 8 per cent in the period 1963-1965, suggesting that we are now in a period of rapid increase in intensity of livestock production.

### More profit per acre

There is evidence from several sources that greater density of stocking leads to more profit per acre. How far can the farmer go in putting this

principle into practice? Nearly all the information available on this point is from dairy farms, but some of the principles will apply also to beef and sheep production. Much useful data has been obtained from three grassland recording schemes sponsored independently by Fisons Ltd., the British Grassland Society and the N.A.A.S. in Cheshire. These show that many intensive dairy farms carry a cow equivalent on 1.0 to 1.5 acres. There is also strong evidence that these heavily-stocked farms have a better gross margin per acre than the rest. In my view it is possible for almost any lowland dairy farm to keep a cow to 1½ acres. How near can be got to a target of one acre per cow depends on soil and climate, the farmer's skill, the degree of self-sufficiency involved and whether any of the grass is, or can be, irrigated.

The few farms with about 1 acre per cow equivalent are mainly either small farms with some or all of the winter feed bought in, farms where a good part of the grassland is irrigated, or farms in an area of exceptionally good summer rainfall. A target of 1¼ acres per cow is, however, reasonably possible for many of the traditional dairying areas in the west of the country. These areas tend to have a well-distributed summer rainfall in a yearly total of 28 inches or more. In the dryer areas of the Midlands and the South-East it will be more difficult to reach this level, but it should be possible to carry a cow equivalent on not more than 1½ acres.

The degree of self-sufficiency obviously has a big influence on the maximum possible stocking rate. One farm may set out to obtain an average of 3 gallons per cow per day from grazing for six months and an average of 1 gallon from silage for the winter. The annual bulk food requirement for a Friesian cow on this farm would be 41 cwt starch equivalent (S.E.). Another farm may feed more concentrate during the summer to get an average of only 2 gallons from grass, while buying in all winter feed. It would have a bulk food requirement of about 19½ cwt S.E., i.e., less than half that of the first farm. Though these are the extremes, many farms tend to one or the other in the degree to which grass is required to satisfy the cow's needs, and this must be remembered when comparing rates of stocking.

## **Irrigation**

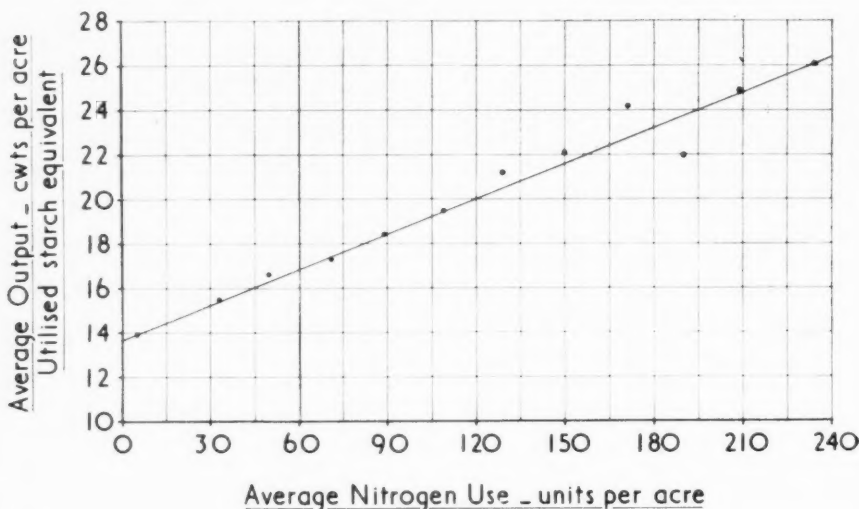
High rates of stocking are made possible by growing much more grass than average and by using it efficiently. The main factors controlling grass growth in this country which the farmer can vary are water and nitrogen. Farms which have introduced irrigation for grassland have been able to increase their rate of stocking 50–100 per cent for each acre irrigated. This is only partly due to the extra grass grown; in addition, they have been able to eliminate the margin which is left on most farms to cope with dry years or dry periods within the year. When properly used, irrigation on intensive dairy farms is highly profitable if the water is easily and cheaply obtained. For those not so fortunately placed, irrigation may also justify inexpensive farm reservoirs to store winter run-off.

## **Response to nitrogen**

Although irrigation at present concerns only a minority, nearly every farm in the country could grow more grass by using more nitrogen. Research suggests that grass continues to respond to nitrogen with equal efficiency at least up to 350 units per acre per annum when grazed, and up to even higher levels when cut. Very few farmers in this country apply more

than 250 units per acre over the whole farm, though higher applications are common in the Netherlands on commercial farms and are probably the main factor in the high stocking rate there.

The grassland recording schemes already mentioned measured the actual output of animal maintenance and milk from grass, field by field, on a large number of farms. The output on fields at the highest nitrogen level was nearly double that of fields at the lowest level. The graph below gives the mean of two year's results (1961-1962) from the N.A.A.S. Cheshire survey; it shows a fairly steady increase in output as the average nitrogen use increases.



At a low nitrogen use of 5 units per acre, the output is about 14 cwt utilized starch equivalent (U.S.E.); at 234 units the output rises to 26 cwt. The relationship between nitrogen level and output in the N.A.A.S. Cheshire survey (1961-62) was an increase of 6 lb utilized starch equivalent for each unit of nitrogen applied. For the Fisons' survey (1960-62) the increase was 6.2 lb; and for the British Grassland Society scheme 5.4 lb for leys and 6.0 lb for permanent grass. These closely similar results from three independent recording schemes give confidence that research findings on response of grass to nitrogen can be translated into real output on commercial farms.

### Commercial significance

The commercial significance of these findings can be appreciated by comparing them with the annual bulk food requirement for a Friesian cow. This would be 31 cwt starch equivalent to supply maintenance and two gallons for a six-month grazing season and maintenance only for the winter. The graph shows that this amount could be obtained from about  $1\frac{3}{4}$  acres of grass which would need about 80 units of nitrogen per acre in order to give 18 cwt S.E. per acre. That this is a realistic estimate is shown by the average for all farms in the Cheshire survey: in 1961 the average output was 18.1 cwt U.S.E. using 1.7 acres per cow with an average of

81 units of nitrogen to the acre. At this level of land use and output, a farmer who wished to intensify by reducing the grass acres per cow to  $1\frac{1}{2}$ , would need an output per acre of about 21 cwt U.S.E. to produce the same amount of food from his grassland. The graph shows that this would need an increase of nitrogen use on the farm from 82 to 138 units per acre. Similarly, for an intensity of  $1\frac{1}{4}$  acres per cow, the production per acre would need to be 25 cwt U.S.E. and about 210 units of nitrogen would be needed. These are the average results that can be expected and they can be



#### THE AUTHOR

**J. F. Ormrod, B.Sc. (Agric.)**, is a N.A.A.S. Regional Grassland Adviser in the West Midlands and is stationed at Wolverhampton. From 1950 to 1954 he was the N.A.A.S. Liaison Officer to the A.R.C. Unit of Experimental Agronomy at Oxford concerned with research work on weed control, new crops, cultivations and fertilizer placement. He then became Grassland Adviser in the East Midland region until 1960, when he took up his present appointment. Mr. Ormrod was Secretary for the first British Weed Control Conference, held in 1954, and to the British Weed Control Council on its inception.

useful as a guide to planning. In practice, of course, some farms would do better than this and others less well.

The first example of increase in intensity mentioned in the previous paragraph can be used to illustrate the probable change in gross margin. Assuming it was a farm of 250 acres, which used 175 acres of grass for 100 cows and devoted the remaining area to cereals, then 150 acres would be needed for the cows at the new level, leaving 25 acres surplus. If this surplus land was ploughed up for barley and there were no changes in fixed costs, the calculation would be:

#### *Extra nitrogen needed*

	150 acres at 138 units	= 20,700 units
less	175 acres at 82 units	= 14,350 units
		<u>6,350 units</u>

If the source of nitrogen is sulphate of ammonia supplying 21 units per cwt, 302 cwt would be needed and the cost at 13s. 6d. per cwt would be £204. To this must be added the cost of any extra phosphate and potash needed. It is not likely that much extra phosphate would be necessary when the nitrogen level was increased, but extra potash might be necessary on some soils at up to half a unit for every extra unit of nitrogen. An extra half-unit at this ratio would need 3,175 units of potash in our example; as muriate of potash at 21s. per cwt this would cost about £56.

*Budget for 25 acres released for barley*

<i>Extra returns</i>		£
Gross margin of barley, 25 acres at (say) £30		= 750
<i>Extra costs</i>	£	
Nitrogen	204	
Potash	56	
	—	= 260
	Extra return	= 490

It is clear from this example that there is a large margin between the probable costs of intensifying grassland production on dairy/arable farms and the extra returns from land released, provided fixed costs are not increased.

### **Comparative costs**

If more cows are carried on the farm as production per acre is intensified, there will usually be changes in fixed costs because of the need for greater storage capacity for silage or hay, for more housing for cows and, perhaps, for equipment with a bigger capacity. As these costs will vary widely from farm to farm, it is not possible to give a typical budget. Some idea in these circumstances of the relative profitability of applying more nitrogen to grass to increase the stocking rate is shown by the costs of keeping a cow for a year compared with purchased foods. For the annual requirement of 31 cwt S.E. already quoted, the amount of extra nitrogen required, at the average ratio of 6 lb U.S.E. per unit of nitrogen, would be  $27\frac{1}{2}$  cwt of 21 per cent nitrogen fertilizer. As sulphate of ammonia, at 13s. 6d. per cwt, this would cost about £18 10s. If we add to this the same proportion of potash as in the example above, the average cost of extra fertilizer to produce the bulk feed for a cow for a year would not exceed £24. The variable costs to add to this, to get a comparison with other foods, are very small but there may be increases in the fixed costs for storage of extra silage or hay. There is a very large margin to cover these when the above cost of £24 is compared with the costs of other foods to give the same amount of starch equivalent. These are £44 for barley at £20 per ton, £62 for hay at £12 per ton with an S.E. of 30, and £70 for dairy cake at £30 per ton. Using nitrogen to carry extra cows is, therefore, a cheap way of feeding them if average efficiency is achieved in converting nitrogen to output.

### **Clover complications**

So far it has been assumed that there is a uniform increase in output for every extra unit of nitrogen, i.e., a straight line response, and this is the general picture from research and from the recording schemes. There may be a complication where clover is vigorous at low nitrogen levels, giving a fairly high output from transferred nitrogen. Under some conditions a change to medium levels of nitrogen (say 80–140 units) may depress clover and reduce the nitrogen transferred from the clover to the grass, so that there is a poorer response to the applied nitrogen. This seems not to happen if management is good and if soil and climate favour clover.

If there is a risk, it can be minimized by the pattern chosen for applying nitrogen. Rather than applying a medium rate—say 100 units—evenly all

round the grassland, nitrogen can be concentrated on those fields where it is likely to give the best response, and other fields can be left with low rates of nitrogen or none for clover to work at its best. Fields weak in clover, such as old leys and permanent grass, or young leys where clover establishment was poor, would receive 200 units or more of nitrogen, while fields with vigorous clover would be restricted to a single top-dressing in early spring of not more than 40 units. The principle has also been widely successful with Italian ryegrass leys at high-nitrogen levels and timothy/meadow fescue leys, which are particularly suitable for encouraging good production from clover, at low nitrogen levels.

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## **The Changing Scene in Barley Varieties**

**F. R. Horne and W. E. H. Fiddian**

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It may not be just chance that the increasing barley acreage has coincided with the production of a large number of new varieties and with a somewhat complex position so far as choice of variety is concerned. All over Europe breeders have for some years foreseen the growing importance of the crop. The keen interest of the malting and brewing industries in many European countries has no doubt had an influence, and it is interesting to note that barley is the only crop for which there is a European Committee which co-ordinates trials of the most promising malting varieties throughout Western Europe. All this has been accentuated by the introduction of plant breeders' rights. In these circumstances the present turnover of interesting new varieties is likely to continue.

It is an historical feature of monoculture in many different parts of the world that the more intensive cultivation of a particular crop increases the problem of disease. Not only do soil-borne fungi increase, but there is also more opportunity for new virulent races of wind-borne and stubble-borne diseases to arise, as is presumed to have happened recently with mildew and *Rhynchosporium*.

It is now well established from experimental work in many parts of the country that a mildew-susceptible variety such as Proctor loses about 7 per cent in yield when mildly infected, compared with neighbouring plots where the disease has been prevented by the use of lime-sulphur. But a severe infection such as was common in 1964 can reduce yields by 20 per cent. There are several races of mildew known in Europe and also several genetical sources from which resistance may be inherited in new barley varieties.

### Resistance to disease

Some of the earlier mildew-resistant varieties, such as Union, Pirolina and Wisa, inherited their resistance from a parent developed at Weißenstephan in Bavaria, but there are now mildew races which largely overcome this resistance. Impala, Maris Badger and Maris Concord derive their resistance from the barley species *Hordeum spontaneum*, but even this source of resistance is being challenged by new races of mildew. The sources from which a breeder may obtain resistance to mildew are by no means exhausted but, as with stem rust in American wheats, it becomes a question whether the breeder can keep at least one step in front of the disease.

The recent and somewhat alarming spread of *Rhynchosporium* (barley leaf blotch) is less well understood. The disease has been noted for some years in spring barley in the south-west, and in autumn-sown spring barley varieties in other parts of the country, but in the last few years it has become more virulent and in 1965 it has been possible to find it in most crops all over the country. The trials so far conducted indicate that none of the two-row barleys tested from Europe are resistant.

Cambrinus, Mosane and Deba Abed are amongst the most susceptible and these should be avoided in the south-west. Proctor and Impala are somewhat less susceptible than most; the former gives a reasonable range of late maturity with malting quality, while Impala is early ripening with grain of feeding quality. Unfortunately higher nitrogen manuring aggravates trouble with *Rhynchosporium*, as does early drilling in a normal season, but in special trials in Devon in 1965 the later sowings have in some cases been the worst infected. This is very possibly due to the high humidity during the past summer. The disease can over-winter on the stubble but the records show that it is by no means confined to second barley crops, and much more needs to be known about the epidemiology of this fungus.

### Malting barleys

For malting, Maris Badger has at least in theory some advantages over Proctor, and this variety, like Proctor, has been approved by the Institute of Brewing for malting barley. It is stiffer in straw and more mildew-resistant. The malting barley buyer, however, not only needs to be convinced by commercial experience that a new barley is at least as good as Proctor, but he also requires to be able to purchase sufficient quantities to fill large silos all with one variety.

There is now fairly wide commercial experience of malting and brewing Cambrinus, and this variety has recently received the approval of the Institute of Brewing as a malting barley. Europa also shows suitability for malting; according to the tests of the Brewing Industries Research Foundation it has a lower nitrogen content and higher malt extract than Proctor.

Its earliness and high yield naturally appeal to growers in areas where *Rhynchosporium* is not so far a problem. However, the promising malting behaviour of Europa and Cambrinus is offset to a considerable extent by their grain appearance which is different from the best malting varieties usually handled in this country. Promoting a new malting barley is surprisingly difficult!

### **Feeding barleys**

An important requirement of a feeding barley is that it should stand up to high nitrogen manuring, and in this respect there are three new recommended varieties which are markedly superior to some of the established barley varieties such as Pallas, Rika and Vada. They have all so far shown good mildew resistance. Impala has been the most consistent yielder over the country as a whole and is the earliest, while Maris Concord has given higher yields in East Anglia. Deba Abed is the shortest and stiffest of all. It is as late as Proctor and is tolerant of the wild oat herbicide barban, whereas the spraying of the other two constitutes some risk.

Two new barleys are to be added to the 1966 Recommended List. The Belgian variety Mosane combines good malting quality, as judged by analysis, with a grain appearance which may prove more acceptable than most continental barleys. It is earlier ripening than Cambrinus and Europa, and has high yield and a straw strength similar to Rika. The Dutch variety Zephyr has a yield at least as high as the best of the existing varieties and also shows promise for malting. Its straw has been stiffer than Rika and it is very slightly earlier. Both Mosane and Zephyr have shown good tolerance of barban and have partial mildew resistance.

A large barley acreage on one farm means that some of the crop may have to wait in the over-ripe stage, and loss of ears due to necking is a problem that is now frequently met. There are small differences between varieties—Union is particularly susceptible and Pallas rather resistant—but these differences tend to be overshadowed by local conditions. In any one trial there may be big varietal differences, but the same pattern is seldom reflected in other trials. Another complication is that it is the stiffest-straw varieties which tend to suffer from wind damage because they remain standing.

Similarly, it is often supposed that there are differences between varieties in their proneness to produce secondary growth under adverse conditions before harvest. This trouble seems to be on the increase, presumably due to steadily increasing nitrogen manuring which not only causes lodging, thus interrupting the transfer of nutrient to the ears, but also encourages the development of latent tillers which are thus doubly stimulated. In fact it has not been possible to demonstrate consistent differences in secondary growth between varieties except in so far as these are related to their resistance to lodging.

### **The recommended list**

An increase in the advent of improved varieties adds to the responsibilities of the National Institute of Agricultural Botany if the Recommended List is to be kept reasonably short. Inevitably trials will throw up varieties which are at least as good as varieties already on the List. It has been a guiding principle that a new variety must be better in some important respect than

an existing variety of the same type if it is to be recommended. This explains why certain useful barleys may become quite widely grown although not recommended, e.g., Ingrid, Swallow and Vada.

The keenness of breeders to make their new introductions available as quickly as possible, in the interests of improved crop production, has sometimes led to the new variety being offered for sale before it has been brought to a reasonably uniform type. This causes difficulty for the seed grower or merchant who is trying to ensure that the seed he produces is correctly named and is not mixed with other varieties. It is of course important that the farmer should be able to obtain an authentic stock of seed of the variety he has chosen, otherwise much of the advantage of variety-testing work may be thrown away. In some cases the breeder has claimed that his new variety, because it is more variable in type, is better able to give consistent yields, but actual evidence of this has been lacking.

The system of regional trials developed by the N.I.A.B. to test the yielding capacities of new varieties in different parts of the country provides a good means of finding those varieties which have outstanding yielding ability. With the production of so many new barleys, it is to be hoped that all the advantages of improved yield and the other important characteristics can be obtained by a sufficient number of varieties which attain a reasonable standard of uniformity.

### **Spring wheat varieties**

The position with spring wheat variety testing is more straightforward than with barley, but breeders are also taking an increasing interest in this crop and one can foresee several factors such as the incidence of *Rhynchosporium*, or an increased emphasis on bread-making quality, which might easily promote spring wheat growing in this country. The performance of Jufy I has been disappointing in recent years, and the higher-yielding and earlier variety, Opal, has been quickly taking its place. Opal, however, is not as stiff as Jufy I, so the advent of another German wheat, Kloka, on the 1965 Recommended List is of interest. Kloka throughout its trials has combined the yield and earliness of Opal with good mildew resistance and a straw which is stiffer even than Jufy I. None of these wheats has the high milling and bread-making quality of Svenno, and there is a big opening for a variety of this type with higher yield and stiffer straw.

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The joint authors of this article are **F. R. Horne, C.B.E., M.A., N.D.A.**, who is Director of the National Institute of Agricultural Botany at Cambridge, and **W. E. H. Fiddian, M.A., Dip. Agric.**, who is head of the Cereals Variety Trials section at the Institute.

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### **20th Oxford Farming Conference**

With the general theme 'The Case for Expansion', the 20th Oxford Farming Conference will be held in the Town Hall, Oxford, from 3rd to 5th January, 1966.

Full details can be obtained from the Hon. Secretary, M. H. R. Soper, O.B.E., University Department of Agriculture, Oxford.

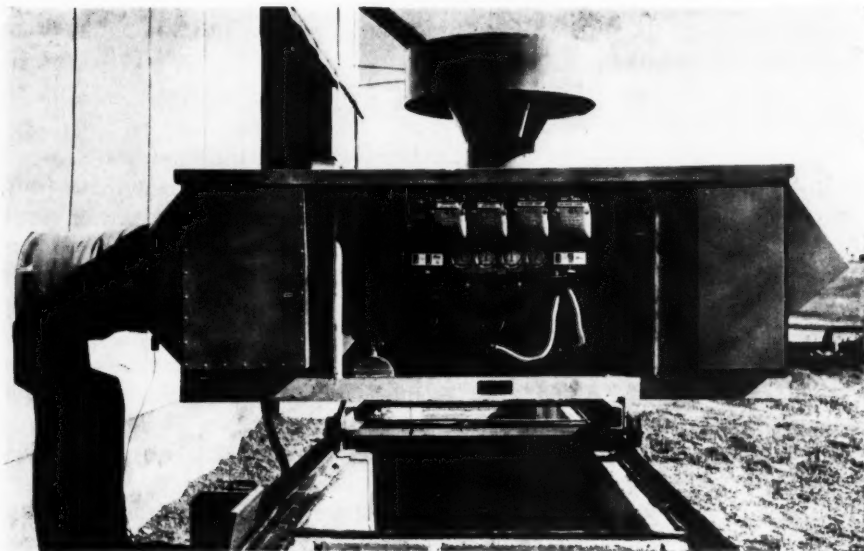
# Chilled Grain Storage

by Ronald Farquharson

CONSERVATION of many foodstuffs by refrigeration has become an established practice in recent years, and perhaps it is not surprising therefore that its use is now being extended to grain. It is also not without significance that the first refrigerated grain plants installed in this country were in flour mills.

There are now a number of farmers who prefer to use moist grain for feeding or processing, and it is clearly more economic for them to conserve it in its naturally moist condition and so avoid the expense and skill required in damping dry grain artificially. Sealed silos have become popular for this purpose, especially for conserving moist barley retained on livestock feeding farms. This system has the disadvantage, however, of tainting the grain and destroying its germination, thereby rendering it unsuitable for many purposes. Moist grain conserved by refrigeration does not suffer from these

*The refrigeration unit with weather shield removed*



disadvantages, and some recent tests on wheat for baking purposes gave better results than would be expected from similar wheat dried and stored at 15 per cent moisture. In this article I have set out my own experience of conserving grain by refrigeration. The method has both a short-term and a long-term application.

### **Short-duration storage**

The greatly increased output of modern combine harvesters and the consequent need for more bulk handling on the larger grain-growing farms has created a need for the temporary storage of high-moisture grain in bulk. The problem arises particularly on farms in the high-rainfall areas.

It is seldom economic to install a high-capacity and high-cost drier to keep pace with the high output of the combine harvesters when they are threshing grain of 23 per cent moisture content or more. Temporary ventilation by unheated air will prevent deterioration to some extent, but it tends to have an uneven drying effect on a proportion of the grain. It therefore makes the subsequent drying of the grain more difficult. With the aid of my own refrigeration plant, I have found it easier and quicker to cool grain from the combine by some 20°F without any appreciable interference with its uniform moisture content. By preventing its natural tendency to heat, the grain can be safely held for a week or so at high moistures until the drier is free to take it.

### **Long-duration storage**

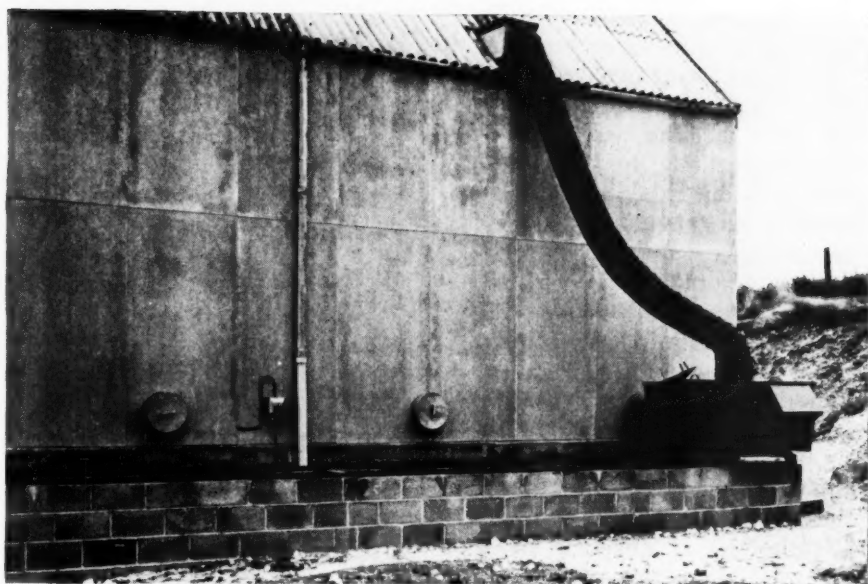
As most grain from driers necessarily goes into store above the ambient summer temperatures, immediate cooling provides a safeguard during that critical period when warm grain is cooling down naturally. The frequent application of artificially-chilled air will gradually reduce the moisture of stored grain by as much as 2 per cent, and the subsequent use of very low temperature natural air during nights or days of low humidity will reduce the moisture of the grain still further. On our own farm, by using this method, we found that wheat put into bins at 21 per cent moisture in September, 1964, contained an average moisture of only 18 per cent when taken out of the bins in April, 1965. It was found to be in excellent condition by the flour millers who purchased it.

### **Methods of application**

Owing to the resistance of stacked grain to air flow, the height of bins can be a limiting factor if the use of excessive horse-power is to be avoided. For this reason some experts and users consider that on-the-floor heaps of grain are the most effective and economic way of using chilled air. It is our experience, however, that, when the introduction of chilled air into existing high bins is required, the problem of height can be overcome by ducting the chilled air in at several levels.

Most existing storage and ventilating bin systems on farms should be capable of being economically adapted to receive chilled air. Adaptation is simplified if the chilling units are easily transportable. Though there is some difference of opinion concerning the use of insulation and re-circulation, my own view is that they are both needed.

Insulation may be unnecessary where grain bins are sited inside buildings or in well-shaded places, but some form of temporary seasonal or per-



*The unit with re-circulation duct attached*

manent insulation of bins exposed to the sun is well worth the modest extra cost involved. The effect of solar heating can of course be countered by more frequent chilling; it is, however, seldom convenient to do so during the heavy intake of grain on hot, sunny days.

For similar reasons, a comparatively inexpensive air re-circulation system is of great assistance in reducing temperatures quickly at busy times. It can provide an intake of low-temperature air during hot days, and thus enable the chilling units to operate efficiently for longer hours. Ventilated bins are easily adapted to take a re-circulation system, and I would expect that such a system could also be applied to on-the-floor grain, though somewhat less effectively.

## **Humidity**

Ideally, complete control of humidity, as well as of temperature, is desirable in this type of grain conservation, but the present high cost of complete humidity control makes it uneconomic.

The air leaving the condensers of a chilling unit is at dew point, or 95 per cent humidity, and very careful attention must be paid to the ingoing air temperatures if some condensation around the duct is to be avoided. We have found that this possible trouble is minimized by ensuring that the chilled air blown into the bins is always about 5°F below the temperature of the grain itself. It is fairly easy to achieve this with a re-circulation system, but is not so simple when natural air is being used. In the latter case it is best to commence chilling during the daytime, to continue during the night, and to stop early next morning when the ambient air temperature starts to rise. The greatest drop in the temperature of the grain takes place in the early stages of storage. Without re-circulation it may be necessary to await the following night's lower ambient temperature before sufficiently low-temperature air can again be blown in.

Further avoidance of humidity can be obtained by positioning the fan 'up-wind' of the evaporator, which allows for a temperature rise of some 2–3°F above the temperature of the air leaving the condensers. Most modern refrigeration units are now designed in this way. Generally, we have found that the higher the moisture of the stored grain, the lower the temperature at which it should be kept when storing for long periods. Bearing this in mind, it is our experience that the correct temperatures of grain for long-duration storage should be somewhere between 35 and 45°F. We think that grain kept at very much lower temperatures for long periods might suffer from a high degree of dormancy, and that there might even be some loss of germination. In spite of the risks involved, as an experiment we did use 'freezing' natural air to reduce some bin temperatures to 30–32°F for nearly one month. However, tests carried out at the end of this period showed no noticeable increase in dormancy or loss of germination. It would not have been practicable to obtain such low temperatures through our condensers because parts of the unit would have iced up.

Most units are fitted with thermostatic controls to cut out the condensers when the temperature of the chilled air falls below 37 or 38°F. As serious mould growth is unlikely to take place below 40°F, there is little to be gained in keeping grain below this temperature.

### **Some technical details**

In considering the capacity of the chilling unit necessary, there are two important questions to be asked. First, what is the total tonnage of grain to be stored? Secondly, at what rate per day is it likely to be brought in for chilling?

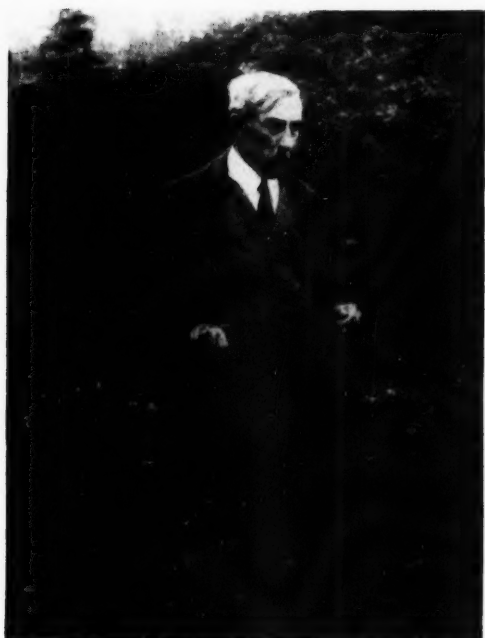
To allow for the worst conditions, I think that a unit of 1 h.p. (or 10,000 B.t.u.s per hour) per ten tons of grain per 24 hours needs to be provided. The longer the spread of harvesting the smaller the unit required, particularly where some drying facilities are also available. As an example, in the case of a grain store capable of containing 350 tons, a 3 h.p. unit (with a capacity of 30,000 B.t.u.s) and a 1½–2 h.p. fan, providing an airflow of 1,200 cubic feet per minute, would probably be suitable.

The chilling unit should be able to provide a quick air drop of 20°F, and should have a lower limit of 40°F. If the unit is sited inside a building, some means should be found to expel from the building the waste heat generated by the condensers.

Prices for chilling units range from about £550 for dealing with 150–200 tons, up to as much as £1,500 for a unit capable of dealing with some 1,000 tons. As a comparison of running costs, some 130,000 B.t.u.s of heat and 1.3 million cubic feet of air are needed to dry one ton of grain from 21 per cent to 15 per cent moisture content, whereas the same quantity of grain can be chilled from 77°F to 41°F by extracting 40,000 B.t.u.s and using 60,000 cubic feet of air. Thus it seems clear to me that the capital cost of a chilling unit compares favourably with conventional drying plants, and that the running costs of conserving grain by chilling are a lot less.

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The author of this article, **Ronald Farquharson, O.B.E., J.P.**, is managing director of Eastbury Estates Ltd., Dorset. He is also a member of the Home-Grown Cereals Authority and of the Southern Electricity Board, and is a past Chairman of the N.F.U. Cereals Committee.



**Memories of  
the work of a  
famous potato  
breeder on the  
Isle of Arran**

## **Donald Mackelvie**

**— An Agricultural Benefactor**

**by H. Cecil Pawson**

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IN a comprehensive article entitled *Famous Potato Raisers*, by W. D. Davidson, published in the Journal of the Royal Agricultural Society of England (Vol. 100, Part II, 1939), the opening sentence runs: 'There is no body of men who have received less of the honour and recognition due to them than the men who from time to time during the past two centuries succeeded in raising new and notable varieties of potatoes.' Of the names he quotes, the one who became more than just a name to me was Donald Mackelvie who was described by Davidson as 'the most successful potato raiser of the past thirty years'. I was fortunate when writing this tribute to get in touch with Robert L. Scarlett, C.B.E., V.M.H., of Sweethope, Musselburgh, who from 1911 onwards was a friend of Mackelvie and whose recollections I have drawn on freely as being worthy of permanent record. Donald Mackelvie, son of a sea captain of Lamlash, Arran, was a general merchant. On 27th August, 1929, when on holiday at Corrie in the Isle

of Arran, I made my way one afternoon to his store at Lamlash. I introduced myself as one greatly interested in his potato varieties, and he thereupon put on his jacket, left instructions in the shop, and conducted me down the road to the small field in which he grew his potatoes. In this field I subsequently took the photograph seen at the head of this article. Nearby he pointed out in small paddocks some of his Highland ponies, for Mackelvie had two hobbies, namely, breeding potato varieties and Highland ponies. The memory of that afternoon, long ago, remains quite vivid, as also my impression of a great and gifted man who possessed that humility so characteristic of true greatness, and whose absorption and enthusiasm in his creative work in plant breeding could truly be described as dedicated.

### **Some Arran varieties**

Mackelvie began breeding potato varieties in 1907 and continued doing so until his death in 1947. I had not realized until that day 36 years ago the immense expense in time and labour involved in such work, and the patience and painstaking efforts demanded of a plant breeder. Mackelvie himself estimated that the chance of providing a useful variety was about one in ten thousand. For many of his varieties he received the award of the Lord Derby Gold Medal and, from the inception in 1916 of the trials on which the medal was awarded until 1938, he won almost as many medals as all other raisers combined. Among the well-known names in the Arran series are Arran Chief, Arran Victory, Arran Comrade, Arran Consul, Arran Banner and Arran Pilot.

Arran Chief was put on the market in 1911 and, with Arran Treasure, was derived from seed collected by F. W. Keay of Ox Barn Farm, Merry Hill, Wolverhampton. The receipt of this seed in 1907 was the beginning of Mackelvie's work. Arran Chief became widely popular as a reliable cropper and having very good cooking quality. In those days publicity was done by individual potato merchants, and tribute should be paid to the able support given to Mackelvie by John Donald of Glasgow, who became one of Mackelvie's close friends. Great Scot, introduced by MacAlister of Dumfries, was earlier in maturing and was the only rival to Arran Chief. Mr. Scarlett's uncle, T. A. Scarlett, was also interested in Arran Chief and took a leading part in the potato boom of 1900 and onwards; he was one of a small band who pioneered what was called the Scotch seed potato trade, although north of the Border the word 'Scotch' was regretted. Smithfield Cattle Show was then the venue packed with farmers doing their potato seed buying for the year. Mr. Scarlett himself recalls spending a whole week in December, 1914, cooking successive 'pots' of Arran Chief to help to persuade English farmers of its fine quality, and there was no doubt of the growing interest in the variety.

Davidson's article mentions that 'during the critical years 1914-1918 Arran Chief did its part in providing the inhabitants of the British Islands with a cheap and wholesome food'. An interesting confirmation is contained in a letter I have received from Mr. Scarlett in which he recalls the floods of rain occurring over the period July, 1916, to February, 1917, in which most varieties of potatoes went soft and rotted with much disease, and writes: 'Only Arran Chief produced a crop and the Edinburgh merchants, headed by my uncle, petitioned the Board of Agriculture to order all Arran Chief to be retained for seed (as Arran Consul was in World War II). This

was done and in 1917 the potato crop was a record due mainly to Arran Chief. This coincided with the maximum efforts of the U-boats to blockade us but the extraordinary big potato crop saved us. (The first food queues occurred in the autumn of 1916 and were for potatoes, but in 1917 no one went hungry if they ate potatoes.)

## Wart disease

The necessity for State control of this disease became evident in 1915, and it was a grievous blow to Mackelvie when Arran Chief was found to be susceptible to it. From then on varieties were sought which would be immune to a disease which might have wiped out potato growing on a wide scale in this country. Trials of new varieties were conducted at Ormskirk in Lancashire for immunity to the disease; the trials were begun by John Snell and were later conducted by the National Institute of Agricultural Botany.

The variety Ally, which Mackelvie had raised from Keay's seed and had originally named Arran Treasure, was not introduced by Mackelvie himself owing to its very poor table quality. It was always characteristic of him that, even when he selected what seemed a prime favourite, he would discard it without any hesitation if any evidence revealed a fault. Arran Treasure was, however, discovered later to be immune to wart disease, and was put on the market by a group of merchants under the new name of Ally.

At the time of my visit to Lamlash, I was familiar with the wide popularity of Mackelvie's immune variety known as Arran Banner. In commending this variety in 1939, Davidson had a prophetic word when he added 'Arran Pilot may yet become a still more popular variety'. It is of interest to note that today the most popular early variety in England is Arran Pilot which was produced in Scotland, while in Scotland it is Epicure which originated in England. If Arran Chief was the variety which brought Mackelvie's name to the fore, it was, as Davidson said, 'the last of the wart-susceptible varieties to make a position for itself in the potato industry'. Arran Banner and others which followed with the immunity guarantee were to add greatly to Mackelvie's fame. Arran Banner was named after John M. Bannerman, who at that time was regarded as the most famous Scottish international rugby player and was captain of Scotland. Seed of Arran Banner was exported in considerable quantities during the season 1938-1939 to Argentina, British Honduras, Canary Islands, Channel Islands, Egypt, France, Greece, Jamaica, Malta, Morocco, Newfoundland, Palestine, Portugal, South Africa, Spain, Uruguay and Venezuela. Well might J. Harvey Howells, writing in the July, 1965, issue of *National Geographic*, say 'Arran potatoes are famous. Donald Mackelvie bred a strain whose seed went all over the world'.

Arran Comrade was also raised from seed supplied by Keay. Arran Victory was raised in 1912 and was grown from a seed taken from a 'plum' of an unknown variety. Arran Consul was introduced in 1924 and was the result of a cross between Flourball and President. The most famous of all, Arran Pilot, was marketed for the first time in 1931, and was the result of a cross between May Queen and Pepo. The position of Arran Pilot today can be judged by the fact that, out of a total of 94,880 acres planted with first early varieties in Great Britain in 1965 and registered with the Potato Marketing Board, 37,254 acres (i.e., nearly 40 per cent) were Arran Pilot.

According to Davidson, the only variety from which Mackelvie got any reasonable financial return was Arran Comrade and that was because 'it was put on the market at a time when money was plentiful. All other introductions will die in debt so far as the raiser is concerned'. It is interesting to learn that T. P. McIntosh, author of *The Potato, its history, varieties, culture and diseases*, 1927, was a great protagonist for Mackelvie and worked out a plan whereby he could have been rewarded for his work by means of a small sum per acre being charged on his named varieties; unfortunately World War II intervened and the scheme fell through.

### Later years

In 1938 the store business was sold to enable Mackelvie to give his whole time to potato work. During World War II large numbers of children were evacuated from Glasgow to Arran, and Mackelvie undertook the lead in this work for the Lamlash area. His labours in this service, coupled with his other activities, resulted in excessive exhaustion, and his eyesight failed him. He never lost his serenity or happy nature, however, and was an example to all in bearing his affliction. Mr. Scarlett remembers that when the war ended, he, as Chairman of the Scottish Potato Registration Committee, and Mr. McAlister of Dumfries went each year to visit Mackelvie. This kind gesture was greatly appreciated by him as well as by his sister and cousin who looked after him, for Mackelvie was unmarried. It was, however, a sad mission, for his potato plots had become neglected because of his physical difficulties, and his work was awry as his chief helper was no longer available. The day was past when he could keep the code register that he had perfected for recording for future reference the facts about his seedlings.

In 1925, Mackelvie had been presented with his portrait in oils by the Arran Farmers' Society and a few of his friends, but it is not surprising that in 1939 Davidson wrote: 'No other public recognition has been forthcoming. Those familiar with the work that he has done, and the immense benefits this work has conferred on both growers and consumers all over the British Islands are baffled to explain such an oversight'. Mackelvie did receive, however, the O.B.E. in the New Year's Honours, 1943.

Like Sir Christopher Wren whose tomb in St. Paul's Cathedral bears a Latin inscription which, translated into English, means: 'If you would see his monument look around', so with Donald Mackelvie, for many a field of Arran Pilot bears witness to the labours of a man who is worthy of grateful remembrance.

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The author of this article is **Professor H. Cecil Pawson, M.B.E., D.Sc., F.R.S.E.**, Emeritus Professor of Agriculture of the Universities of Durham and Newcastle upon Tyne.

# Farm Buildings Feature



**This feature contains two articles which have been especially written by members of the Ministry's Agricultural Land Service—**

★ **F. W. Holder, B.A. (Arch.)(Lond.), F.R.I.B.A.,** has written an interesting article on the industrialization of farm buildings. This is a subject which is clearly of growing importance. Mr. Holder has been the Ministry's Chief Architect since 1952, and before then had professional experience in private practice, in local government and in the Ministry of Works.

★ **Charles Dobson, A.R.I.C.S.,** who is one of the Ministry's farm buildings advisory officers and is stationed at Reading, has contributed an informative article on the maintenance of farm buildings. The article is based on a maintenance survey that was recently made of a 1,000-acre farm in Hampshire. Before joining the A.L.S. in 1948, Mr. Dobson had professional experience with the West Riding County Council and the Air Ministry.

# Industrialized

## Farm

## Buildings

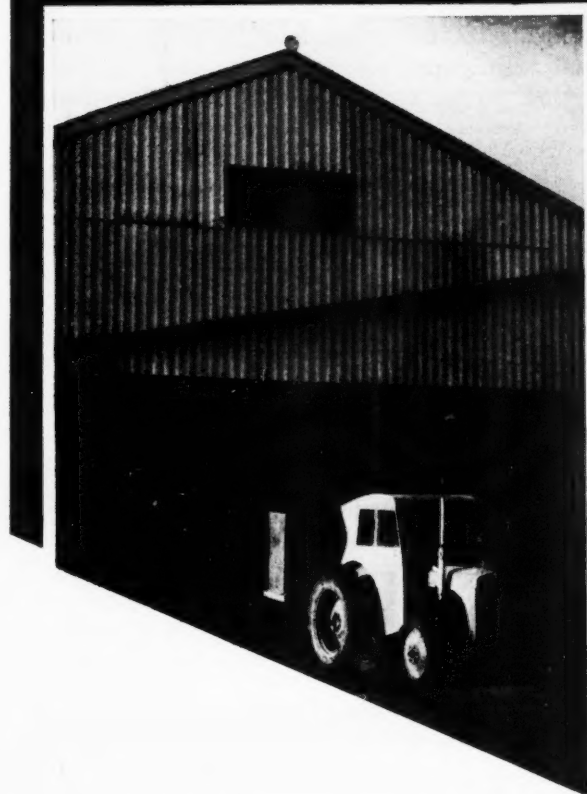
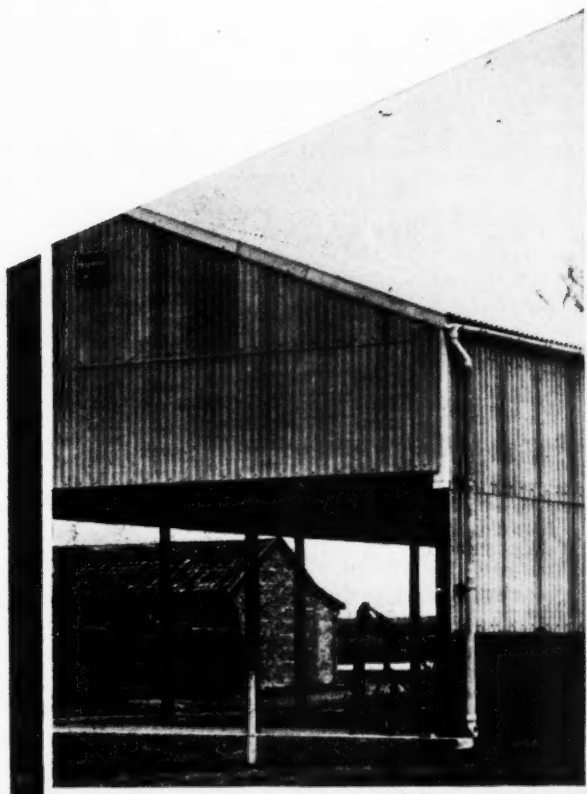
F. W. Holder

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MOST people are familiar with the term 'prefabrication'. 'Industrialization', although related, applies more to the underlying principles behind prefabrication than to the end product itself. When used in connection with buildings, industrialization has come to mean in the widest sense the substitution of factory-made whole buildings or large components for the traditional bricks and mortar. This practice is by no means a new one. Joseph Paxton built the Crystal Palace with components which were cast in a London foundry and put together on the site. In a humbler sphere, the small builder who buys his plaster in bags instead of running the lime, or who gets his doors and windows from a factory instead of making them himself, is participating, however modestly, in the industrialization of his industry.

In time of war or other period of crisis, when it becomes necessary to produce buildings quickly with an inadequate labour force, industrialization always comes to the fore. One can recall the many types of factory-made buildings which supplied a need during and immediately after World War II. Names like Nissen, Orlit, Seco, Plasterboard, Maycrete and Airey spring to mind, and it is significant that, after a quarter of a century, many of these ostensibly temporary structures are still in use. At the present time, with a continuing housing shortage, many British and foreign building systems are coming on to the market.

We are always being reminded that tradition dies hard in agriculture. Yet on the modern (and not so modern!) farm can be seen examples of factory-made buildings, from the 50-year-old Dutch barn to the latest thing in glass-lined tower silos. There must be very few horticultural holdings nowadays that are not equipped with standard timber or metal glasshouses, and poultry farmers have been using sectional wooden buildings for many years. The only thing about these buildings which cannot be described as industrialized is the prepared foundation. This is still traditional in character, but the time may not be far off when even foundations can be bought over the counter. Then only the holes in the ground will have to be made on site!



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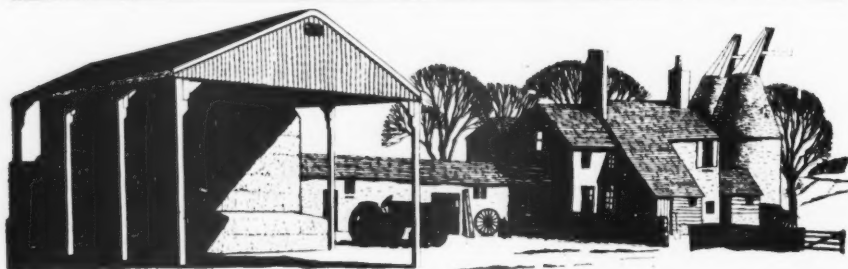


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The Farm Improvement Scheme and Horticulture Improvement Scheme have prompted the development of a number of successful types of buildings and components. The simple timber chicken house has grown into a highly-mechanized, insulated piggery, and the requirements of the refrigerated fruit store have been met effectively by a number of designs for sectional buildings. In these instances, the use of precision-made wall and roof units, neither too large nor too heavy to be handled by unskilled labour and with simple fixing methods, have to a great extent superseded the more conventional buildings of brick and concrete block.

In the last two or three years, storage of loose grain on the floors of buildings has received much publicity. This method of storage poses a number of real problems over the strength of containing walls. Traditional methods of building effective containing walls are too expensive. They are also too permanent for modern farming, where flexibility of buildings is important. As a result, a host of factory-made, thrust-resisting walling units have emerged. Farmers can take their pick of steel, timber or concrete components, all of which are suitable for fixing to their existing buildings or to new framed buildings and are guaranteed to resist the pressure of stored grain. For the more conservative, there are always the proprietary steel, timber and concrete vertical bins as an older and alternative method of storage.

As regards fittings and equipment, the list of factory-made articles is endless, and embraces items like milking stalls and equipment, fencing and gates, racks, mangers and ducting. Most of these items have been designed for use in conjunction with the standard types of buildings such as are found on the modern farm.

It would seem, then, that industrialization has left its impression. Has it gone far enough or can it be used to greater advantage? In the specialist buildings, such as pig houses, which are dimensionally and in other respects similar to each other, there is little which can usefully be done to raise standards of building efficiency. So, too, with grain storage in bin or on floor, the 'package deal' has arrived, and represents perhaps the ultimate aim of industrialization.



*'Frame' construction.  
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conjunction with a variety  
of cladding systems*

### **Standardization of parts**

There is, however, a wider field in which industrialization can make a contribution. The larger building of variable dimensions, for general purpose use or cattle housing, is usually a framed structure of standard design. It has its origins in the Dutch barn prototype, which was developed after World War II through the M.A.F. component building, and which provided a set of dimensions complementary to the larger cladding units (sheet metal or asbestos cement) available at the time. These, while excellent in themselves, have a limited use unless they can be used in conjunction with other materials. It is easy to visualize large panels, incorporating insulation, with internal and external faces of steel, timber or concrete, whichever is most suitable for strength and function. Ideally it should be possible for units of different materials to be interchanged as necessary, and to be fixed to or removed from the basic framework of the building.

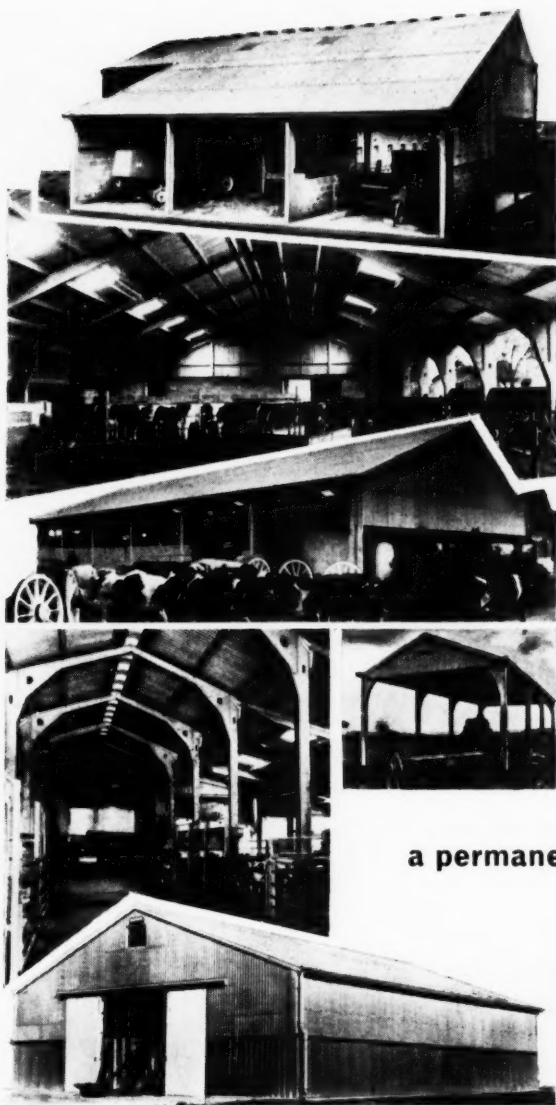
In order to promote a system of this kind, it is first of all necessary to establish a method of dimensional co-ordination based on the user requirements of the building. Such a series of dimensions would be related to a 'module', or unit measurement, for horizontal and vertical elements. This would involve acceptance of a discipline which, although fairly rigid, would be designed to fulfil most of the uses to which the building could be put. The 'one-off' building would be superseded by a standard article having a wide range of dimensional possibilities.

What emerges from a study of this kind is the need for a kit of parts on the lines of a boy's Meccano set, but full size. In designing such a kit, two major problems present themselves; namely, fixing and weathering. With the first, any system of units must be interchangeable not only with other types of units but with different structural frames. Weathering is a most important part of the design as it is concerned integrally with the jointing of the components. It is at the joints that potential weaknesses lie, and no system is efficient unless the design presents the minimum of risk. An industrialized system does not permit of botching on the site to rectify deficiencies which existed at the factory stage.

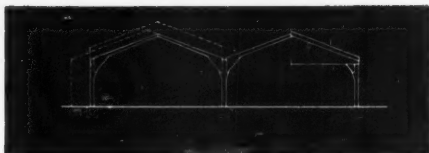
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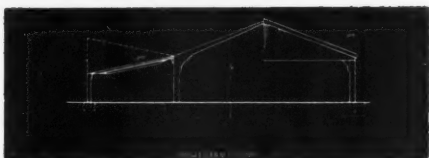
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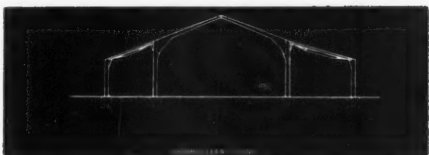
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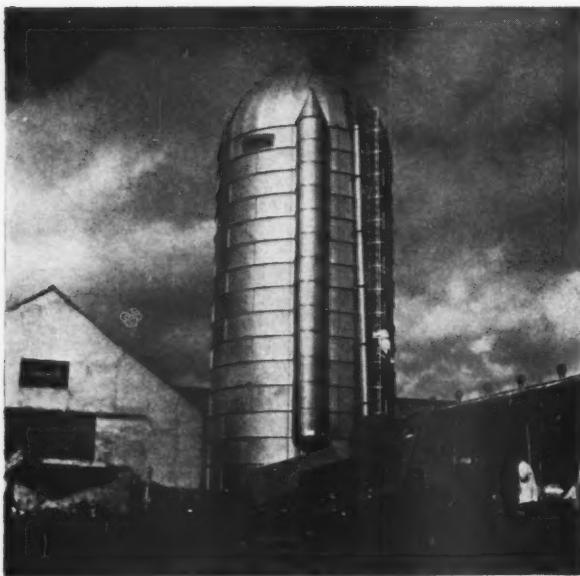
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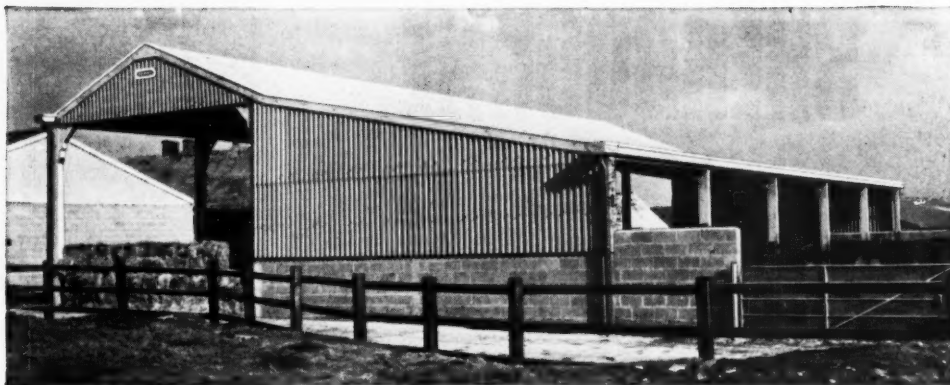
*In the centre, the complex factory-made storage building, or the 'package deal par excellence'. On the left is a building of traditional construction; on the right a prefabricated timber building*

### Further progress

Undoubtedly, there is much scope for system building in the farm of the future. The drift of labour away from agriculture and the preferences of building operatives for city jobs, are factors too real to be ignored. The need to provide covered storage space as quickly as possible, in an uncertain climate, is also important.

On the other hand, industrialization does not necessarily spell quality, nor does it automatically imply good design. A factory-made building whose components are inadequately designed or used unsympathetically, can be as visually offensive as any 'traditional' eyesore. Industrialization is here to stay; it is up to its users to ensure that it provides them with the answers to all their building problems.

The costs of industrialization are, on the whole, rather higher in this country than those in traditional methods, and this is understandable where only 15 per cent of building is industrialized. When 70 per cent, the Russian equivalent, is reached, perhaps the reverse will be the case. But if, in the long term, value for money is a matter not only of capital outlay but of speed in construction and early completion and operation, then by modern thinking industrialization should be worth while. So much of what we use today comes off the factory production line that it is not unreasonable to expect that more and more of the buildings used on farms will come to us via the same route.



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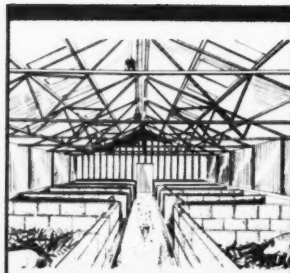
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# Maintenance of Farm Buildings

— a case study

by Charles Dobson

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A RECENT maintenance survey of a well-equipped 1,000-acre farm in Hampshire produced an estimate of £6,500 for the cost of repairing and painting the buildings. Most of the buildings had been erected since 1950 and the estimate therefore came as a shock to the owners. A rough breakdown of this figure showed that £2,000 was for painting and £4,500 for repair work. It was decided to try to assess whether it would be worth while spending these amounts and whether the costs could be reduced in any way.

## Worthwhileness

A set of simple questions was devised to check the worthwhileness of repairing each building on the farm. The questions were:

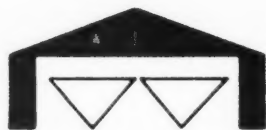
1. Is the building obsolete or likely soon to become obsolete in design?
2. Does it interfere with the expansion of other important enterprises?
3. Does it interfere with the free movement of vehicles, stock or materials?
4. Would a replacement building add to the rental value or efficiency of the farm?
5. What would be the cost of maintenance?
6. What would be the cost of replacement?

If the answers to some of the first four questions were 'yes' and the costs of maintenance approached the cost of replacement, then the wisdom of repair would obviously be in doubt. Obsolescence of design is always to some extent a matter of opinion and the answer to question 1 could not be as factual as the answers to the other questions. Maintenance and replacement costs would show the extent of obsolescence of the structure.

There is increasing evidence that the period between erection and obsolescence of design is shortening. Most farmers know of good cowsheds built since the last war which have been discarded, of milking parlours erected within the last ten years which have been found too small, of farrowing and fattening houses that have been found to be inefficient, and so on. Consequently, future farm policy had to be borne in mind when forming the various opinions on each building.

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The building on the left is 90' long  $\times$  40' wide  $\times$  12' high to eaves, and was erected in Roxburghshire. The 5' wide canopy was supplied to client's special requirements.

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Out of the £4,500 estimated for building repairs it was found that £500 was required for repairing the post-war buildings and £4,000 was to repair four older buildings:

Cart shed	40 × 30 ft
Lean-to shed	50 × 15 ft
Calf house	50 × 15 ft
Calf house	65 × 17 ft

The estimated replacement costs for these buildings were £1,500 for the two general-purpose sheds and £3,750 for the two calf houses, i.e., a total of £5,250. Both the cart shed and lean-to were low in height and of limited use and the calf houses were not up to the best modern standards. Three of the buildings were loosely grouped together and, although not interfering with movement, they were sited where they would form an obstacle to future expansion of an important enterprise. Not surprisingly it was decided to patch them up cheaply, using farm labour, instead of repairing them and to plan for their future replacement on other sites.

The post-war buildings, which had a replacement value of several thousand pounds, were in the main soundly planned and it was obviously worth spending £500 on repairs to keep them in good order.

### **Reduction of other costs**

It was heartening to have reduced the repair estimates from £4,500 to about £500, but the prospect of paying out £2,000 for painting alone was somewhat daunting. Further analysis of the £2,000 showed that about £1,000 was for painting steel angle trusses, purlins, sheeting rails, stanchions and galvanized roofing sheets, all of which were showing signs of corrosion. Since all these buildings passed the test for worthwhileness, the cost had to be accepted. The remaining £1,000 was for repainting large areas of timber doors, windows, hoppers, ventilators and other sundry fittings. An alternative was to drop the policy of painting woodwork and to substitute brush creosoting. This would mean burning off or removing old paint, but even allowing for the cost of removal this method offered considerable immediate savings (about £500) and greatly reduced preservation costs in the future. An added advantage was that the danger of stock being lead poisoned by eating old or flaky paint would also be removed. Perhaps the only disadvantage of the creosoting system was that the farm would not look quite so spick and span as when well painted.

The estimated costs had now been brought down to a manageable figure but, as for most farms, two further points remained to be settled. Who would do the work and how could future maintenance costs be reduced?

### **Who would do the work?**

In new buildings, builders' labour generally accounts for 40–50 per cent of the cost, i.e., less than half the total cost. Maintenance work on the other hand often requires only little material, and labour costs can account for as much as 70–90 per cent of the total cost. Obviously, where an owner-occupier has labour to spare which has the necessary skills, it is worth his while carrying out much of the work, particularly the smaller simpler jobs, with his own labour. It is also obvious that it is sensible to buy the best materials that can be afforded. On larger farms which have problems similar to those in the above example the alternatives would be either to employ local builders on a

contract basis or to employ a full-time maintenance worker. In either case it would be worth while seeking skilled professional advice to assess the probable cost of both methods.

When farms were part of large estates, it was often the policy for the agent to arrange for annual summer inspections. This is a sensible arrangement which could be copied to advantage by many owner-occupiers today. Regular and thorough inspections should preferably be made when the buildings are empty. Seeing what is wrong is usually a simple matter, but sometimes defects are hidden and their diagnosis does require skill. Estimating the cost of repairs also requires skill and experience, and here again on larger farms it would often repay owner-occupiers to employ skilled professional advice.

### **Avoiding future maintenance**

The buildings on any farm that are maintenance-free are negligible in number, but there is no doubt that future maintenance costs can be reduced with proper planning of buildings and their details. Nowadays lattice angle trusses would seldom be adopted and portal steel frames would be preferred where steel was the chosen material. Pressure-treated timber purlins would be cheaper initially and cheaper in maintenance costs than steel angle purlins. Although portals would need painting, the cost would be very much less than for comparable lattice trusses.

Instead of using steel portal frames, the farmer can also choose from pressure-impregnated timber and pre-cast reinforced concrete frames. Both of these should, if properly fabricated and erected, give lower maintenance costs than steel work.

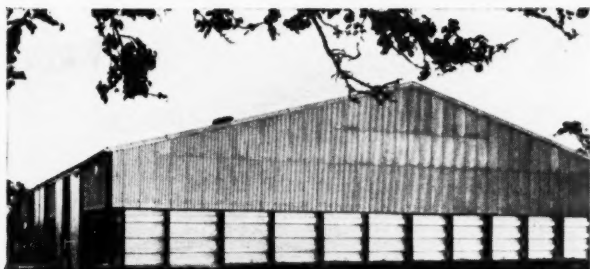
Asbestos cement sheeting gives a cheaper and usually more durable roof than unpainted galvanized steel. Although asbestos cement makes an excellent roofing material, it should not be used as cladding in positions where it is likely to be damaged. In such situations, brickwork, block work or metal sheeting could be substituted. Metal sheeting could be either ordinary galvanized steel which will require some maintenance, or galvanized steel with a factory-applied bituminous or plastic covering, or aluminium. These latter materials are more expensive than ordinary galvanized steel, but should be relatively maintenance-free.

When choosing materials to insulate roofs and walls, only materials which will stand up to farm conditions should be chosen, e.g., glass wool or asbestos wool with asbestos cement lining sheets. Other materials such as plaster-board, straw board, untreated fibre board, unprotected polystyrene and hardboard should all be avoided because they are either damaged by vermin or moisture or require regular painting.

The design of drainage layouts, the positioning and hanging of gates, doors and windows, and many other details are all equally important if future maintenance is to be avoided. Many useful hints are contained in the Ministry's Fixed Equipment of the Farm Leaflet No. 26.

Tests have shown that asbestos rainwater gutters are the best choice when compared with other traditional materials. When these tests were carried out, however, plastic rainwater goods had not been on the market long enough for a positive opinion to be formed as to their merits. It may be that the best combination in the future will prove to be asbestos cement eaves gutters with PVC rainwater pipes, but like many things in maintenance work, only time will tell.

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**A previous article by the author discussed changes in the purpose of farm workshops. This article examines how workshops should be equipped to meet these changes**

**H. J. Hine**

## **The Modern Farm Workshop —**

### **its siting and equipment**

---

A workshop to serve the mechanical equipment of a well-managed farm must look after maintenance first, then the running repairs, and lastly the major overhauls and the jobs involving machining. Therefore, when a new workshop is to be planned or an old one re-equipped, its suitability for day-to-day tasks to help maintain the farm implements in good condition should be the first consideration.

The siting and construction of the workshop building must have regard to the ease of bringing implements into it in all weathers. The workshop must be alongside a hard road, and its door must be large enough to admit most implements without their having to be dismantled. Good heating and lighting are needed in the shop if full use is to be made of it in winter.

#### **Lubrication and tyre pumping**

Lubrication is the most frequent routine maintenance task. The task is made easier and the lubrication more effective if a mobile canister or power-operated oil gun is used. The high pressure is more likely to get the lubricant completely into the bearings, and the less frequent filling due to the larger capacity reduces the chance of drawing-in air which gives uneven pumping and makes it difficult to tell how much lubricant has gone out of the gun into the bearing.

Compressed-air systems for inflating pneumatic tyres go a long way towards preventing the serious under-inflation, leading to tyre damage, likely to occur where the total number of tyres on tractor, vehicles and implements is too large for them to be looked after easily by hand pumps. Any other inexpensive aids to tyre care that are available are worth purchasing, e.g.,

vulcanizing outfits which use a tablet of solid fuel to fuse rubber patches on to inner tubes. The air compressor can also be used for spray painting and for blowing dust from inaccessible places such as electrical windings.

### **Hand tools**

Most of the hand tools needed in maintenance work are of the kind that accumulate from kits that come with implements and from purchases at times of need. But there should also be in the workshop complete sets of open-ended and ring spanners. Much damage can be done by using spanners that are a little too large, or by resorting to using pliers and pipe wrenches on nuts when the correct spanner would do the job easily and without damage.

To be able to use good benches and vices is one of the benefits of doing a job indoors instead of outdoors, and money spent on these fitments should not be grudged.

Although intricate overhauls of tractors and implements will not be undertaken, replacement of faulty components by reconditioned units will almost certainly be done in the workshop from time to time. A pulley block and chain hung from an overhead rail, or from a beam or on shear legs, will lift heavy components and hold them in position while they are being fitted. Equipment of this kind can often enable one man to do a two-man job. A good high-lift hydraulic jack will also be needed for any underneath jobs for which pulley tackle is not practicable.

### **Power tools**

For repair jobs, an electric drill is becoming almost essential. A bench-mounted pillar drill gives the most precise work, but a heavy portable drill clamped to a stand by spring-loaded linkage is adequate for most jobs on the bench and can also be used for work away from the bench.

For sharpening knives and cutters on implements, and indeed for sharpening the workshop tools themselves, a power-driven grinding wheel saves time. Grinders and wire scrapers can be fitted to a portable electric drill, but there is much to be said for having also a separate bench machine which is always ready to be switched on.

Some way of heating metal before it is bent or hammered is needed quite often in the farm workshop, and a gas welding torch used on a brick hearth will do this in addition to its own task of welding and brazing and cutting. Welding is such a generally-used method of helping out in running repairs that it may be worth while having electric welding as well as gas welding because each has advantages in different applications. The capital cost of having both sets need not be large, but it must be remembered that arc welding does make a fairly large demand on the electricity supply, particularly just at the time of striking the arc and at times of fluctuation while the work is proceeding. These intermittent high demands are reduced by condensers.

Soldering is a frequent job; an electric soldering iron of 1 lb size will look after most of the work required, but a very small iron in addition is useful for making electrical connections.

The care of batteries must be considered. Some of the implements which have engines with starter batteries have only seasonal use, and steps must be taken to prevent batteries deteriorating while they are stored. The workshop will need a filler for adding distilled water to the cells, an hydrometer

for testing the electrolyte, and a charging outfit to transform the mains supply to a suitable voltage and rectify it.

Where much estate work is to be done, a saw bench is worth while. This can be an electrically-driven saw, sited perhaps in a building adjoining the workshop, or can be a petrol or diesel outfit to be used outside. There may be fire precaution circumstances that make wood sawing in or near the workshop undesirable. Where there are many trees to be dealt with, a large portable circular saw, in a frame which can be carried on the three-point linkage of a tractor and operated through the tractor's power take-off, is the best proposition.

### **Storage of equipment**

A portable saw is an example of equipment which will be used around the farm more often than in the workshop. It is well to have a separate building, perhaps a lean-to, for storing equipment of this kind. A separate building may be needed also for lubricants. Storing drums of oil out of doors does not matter much if the drums are still sealed as they were by the oil company, but it is a bad thing if they have been closed merely by a bung or by a grip-tight cap. When the contents of the drum cool and contract after being heated and expanded by sunshine, suction can draw moist air into the drum to form a sludge with the oil. Inside a building the conditions are more even, and a cabinet with a serving pump can be used, or a stand to keep a tapped drum at the right height for filling measuring cans and pourers.

Maintenance calls for the replacement of wearing parts. Large and expensive components need not be kept on the farm if the farm machinery is reasonably up to date and the dealer's stock has proved adequate and available at short notice, but smaller parts, and any parts that are needed at predictable intervals, should be kept on hand and stored in boxes or bins. If possible, each particular part should have its own box, however few the number of them to be held in stock. Each box can have a card on which the number of pieces put into the box is recorded. When any parts are removed, the number written on the card is crossed out and the reduced number substituted. At some regular interval, say three months, the cards should be checked for re-ordering to be done.

*(The author's first article on farm workshops appeared in last month's issue.)*

# Agricultural Development in Hungary

W. T. Baker

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FACED with the major task of rebuilding its cities, following the devastation of war, the Hungarian Government has not been able to find as much capital as it would like for agricultural investment. Farms have been re-organized into 200 state-controlled units averaging 7,000 acres each and 3,400 co-operatives averaging 3,000 acres each. The Hungarian Government undoubtedly prefers the state farm system which gives greater control over output. Quotas are issued to state farms to meet national demand, and output per hectare is said to be higher than on co-operatives. This may be due, in part, to greater allocations of fertilizers and to the larger number of technical advisers posted from the agricultural universities.

The acreage of individual state farms has been steadily increasing over the years as a result of amalgamations with other less economic state farms. Co-operative farms were formed in the fifties by pooling the land of small owners and sharing the profits from collective management on the basis of rent and proportion of work. The number of these farms has remained fairly constant. Although there is advantage from large-scale farming, the number of workers remains roughly in proportion to the original small farm ownership; 35 per cent of the population work on the land, or one person to 22 acres.

It is only during the last five to six years that a start has been made on modernizing capital equipment. The modernization programme is in the charge of the Chief Architect of the Hungarian Ministry of Agriculture; his Department designs and approves new buildings and approves Government grants. There are no private building contractors; the work is specified and supervised by the national building firm Agroterv, where the Director and employees are paid by the State. The price of building material is fixed and labour is paid at national rates. There is, therefore, no competitive tendering.

## **New buildings**

New buildings are solidly constructed of brick with slate or reed roofs to keep out the  $-20$  to  $+30^{\circ}\text{C}$  range of temperatures. Agroterv appears to have little skilled labour, so that the work is done on the farm. Cows are

housed in 100-cow sheds, often with 500 cows in one unit. They remain indoors throughout the year, the land being in arable silage which is fed or ensiled according to the season. Modern sheds allow trailers to be taken through for filling the head-to-head mangers, but much work is still by hand, especially milking. One cowman to 20-25 cows is not unusual, even after £180 per cow has been spent on a new shed. The Chief Architect's Department is experimenting with concrete components for framed buildings; these could be made lighter by using pre-stressed reinforcement. Steel trusses are bolted to concrete eaves plates and asbestos roofs are underdrawn with hardboard to avoid condensation. Reed, of which there is a good supply on the shores of the famous lake Balaton, is used for insulation, as there is a shortage of other materials. Walls are of brick, above shuttered concrete base walls; the use of light-weight aggregate infilling has yet to be developed.

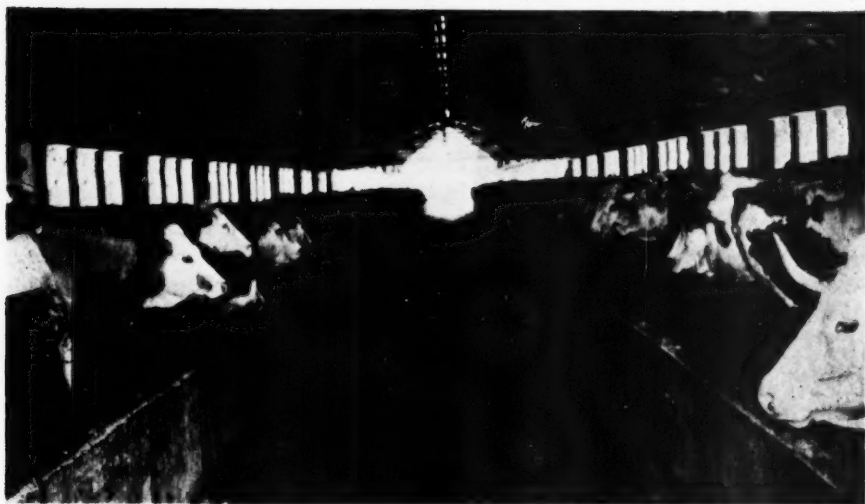
The yard-and-parlour system was tried experimentally in Hungary about six years ago. Yards were semi-covered, and the not unexpected result was that cows lost condition to such an extent in winter, that the system ran into disfavour. Other reasons given for cowshed milking are that, being housed throughout the year, cows need greater individual attention and that troubles from self-suckling arise from loose housing. There is little de-horning of cattle. Hungary is famous for its young, uncastrated, Hungarian chequered bulls, which are sold at about 15 months to East and West Germany and Russia. Beasts are tied under cover in much the same way as dairy cows, and labour to feeding and cleaning remains high.

Pigs are kept in units of up to 500 in Danish-type buildings or in long runs of cottage-type sties. In the former, temperatures are kept up by the sheer weight of numbers, but in the latter it is not unusual for liveweight gain to fall off almost entirely in winter. The Chief Architect is experimenting on methods of insulation and management in pig buildings.

### **Need to increase productivity**

Perhaps the greatest problem is the need to reduce labour and increase productivity. As other industries expand, it will be possible to absorb

*A 100-cow shed erected by Agroterv, with Hungarian chequered horned cows on the right and  $\frac{3}{4}$  Hungarian chequered  $\times$   $\frac{1}{4}$  Jersey crosses on the left*





*Hungarian chequered  
× Jersey cross cows  
in one of the first  
cowsheds to be  
erected in framed  
construction with  
steel rafters*

agricultural workers, but those buildings which are being erected now need to be designed for greater working economy. Parlour milking, with loose housing under cover or cubicles, needs a further trial, while self-feeding, or easy-feeding of all forms of stock could well be developed. For those cowsheds that remain, machine milking and mechanical handling of dung are subjects for investigation.

There is an efficient system in Hungary of state-controlled wholesale and retail horticultural marketing at predetermined prices. Grades are fixed by Government graders stationed at the principal markets. Fruit and vegetables are of a high standard and well presented. Tomatoes can be grown out of doors, but glasshouses are now being built to provide more even grades in competition with foreign trade. Interest was shown in recent developments in glasshouse design.

Wine is a national drink made from grapes grown on the forest soils of the Balaton and Matrahaza districts. Some of the matured wines find their way on to world markets, but great effort is being made to establish and increase foreign trade with both eastern and western countries. The larger vineyards on state and co-operative farms are equipped with modern wine presses and fibre-glass-lined storage vats, some of which are temperature-controlled. There are, however, many small vineyards of under 2½ acres which are owned by workers and run by the family as a part-time occupation. Cottagers have their own cellars and wooden vats, where the making and maturing of good wine is a matter of great personal pride.

Much has been done during the past ten years to improve agricultural conditions in Hungary and great interest is being shown in technical progress. I found many English journals, including *Agriculture*, in the university libraries, while the Magyar travel the world in the quest of knowledge.

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The author of this article is **W. T. Baker, T.D., A.R.I.C.S., A.A.I.**, who is one of the Ministry's Divisional Land Commissioners in the Agricultural Land Service and is stationed at Guildford, Surrey. He has recently made an official visit to Hungary.

## Gross Margins from Glass

W. L. Hinton

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THE majority of glasshouse nurserymen in England and Wales depend for their living on no more than a quarter of an acre of glass each. For such a grower good profits in any one year depend on obtaining a high level of sales per square foot of glass and on securing high gross margins per hour of labour put into the production of the various crops.

As in any business, profit in glasshouse production is the difference between total sales and total expenses. The productive lines have, however, each to make as big a surplus (or gross margin) as possible over their variable costs in order to meet the general expenses and leave a balance, i.e., net profit. Net profit is the sum of the gross margins obtained from the separate crops less the general overhead expenses common to all crops. Examples of the latter are regular labour, glasshouse depreciation, and bank charges.

To obtain an adequate profit on the smaller nursery the glass must be cropped intensively throughout the year. The labour requirements of the various crops and crop combinations must also be considered. The cropping programme must provide a high aggregate gross margin and not be too speculative. Furthermore, the work demands of the programme over the year must be balanced by the labour available to deal with it.

The purpose of this article is to show that keeping proper records of production materially assists a grower to plan his subsequent cropping on a more profitable basis. To this end, the article examines recorded crops of tomatoes, lettuce, and chrysanthemums—the most common crops grown on small nurseries. The size of the glasshouse unit in each case is 1,500 square feet, or approximately one-thirtieth of an acre. This is the most common size of glasshouse unit on Land Settlement holdings and the data presented here comes from a computer planning study recently published.\*

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\**Profit Maximisation on Small Scale Horticultural Holdings*, by W. L. Hinton and G. Kitzopanides, published by the Land Settlement Association, July, 1965. 2s. 6d. (including postage) from the Farm Economics Branch, School of Agriculture, Cambridge.

## Cold tomato production

The labour requirements, gross margins and sales for the production of cold glass tomatoes are:

**Table 1.** **Cold Tomatoes**  
*Labour Requirements for 580 Plants*

<i>Operation</i>		<i>Man hr</i>
Dig and sterilize, apply base fertilizer and rake		10
Planting (150 plants per hr) and lay trickle irrigation		4
Ball watering		3
String up (150 plants per hr)		4
Twist and side shoot		40
De-leaf		14
Ventilate, water and feed (22 weeks @ $\frac{3}{4}$ hr per week)		16
Picking (290 chips-10 chips per hr)		29
Remove plants and clear ground		4
		<hr/> 124
<i>Variable costs</i>	<i>£</i>	<i>Returns</i>
Base fertilizer	6	3,480 lb @ 1s. per lb
580 plants	12	(6 lb per plant)
Liquid feed	3	
Sterilant	8	
Containers	15	
Total variable costs	<hr/> 44	
GROSS MARGIN	130	
	<hr/> 174	<hr/> 174

The gross margin for the whole crop is £130. Gross margin per hour engaged in producing the crop is slightly above 20s., and sales per square foot of glass are 2s. 4d. Gross margin per square foot of glass is 1s. 9d. For each lb per plant increase or decrease in yield, returns rise or fall by £29.

## Heated tomato production

If the same area of glass is used for heated tomato production (and to give the same gross margin), the variable costs increase by £33. The larger part of the increase is for fuel, i.e., £29, but some increase is due to the extra containers required for the bigger crop, i.e., 30s. for the 342 lb extra yield; 50s. extra is also spent on the earlier tomato plants; 500 plants are grown heated not 580 as before. Labour requirements are increased by 21 hours to cope with boiler stoking (6 weeks at 3½ hours).

**Table 2.** **Heated Tomato Production**

<i>Variable costs</i>	<i>£</i>	<i>Returns</i>	<i>£</i>
As for cold production	44	3,822 lb @ 1s. 1d. per lb	207
Additional variable costs	33	(7.6 lb per plant)	
Total variable costs	<hr/> 77		
GROSS MARGIN	130		
	<hr/> 207		<hr/> 207

The average price assumed for heated tomatoes is 1s. 1d. per lb. For the heated crop to give as big a gross margin as the cold crop, given these prices, yield per plant must be 7.6 lb or more. Should the heating system be good enough to produce 10 lb per plant, which is quite possible with an early crop, the gross margin will be £65 above the break-even point. At the break-even point the heated crop returns a gross margin of 17s. per hour to labour, while sales per sq. ft of glass are 2s. 9d.

## Lettuce

Cash outlay and labour requirements for this crop are low, as the following table of variable costs and labour requirements shows.

**Table 3.**                      **Cold Glass Lettuce**  
*Labour requirements, Gross Margins and Variable Costs*  
(3,000 plants—8 in. × 8 in.)

<i>Operation</i>	<i>Man hr</i>	<i>Variable costs</i>	<i>£</i>
Digging	7	Fertilizer and seed	2
Planting (500 per hr)	6	Containers	9
Hoeing (× 2)	6		—
Watering with trickle harness	1	Total variable costs	11
Cutting (10 crates per hr)	12	GROSS MARGIN	79
	32	Sales 2,700 heads @ 8d.	90
	—		—

It is assumed that 90 per cent of the lettuce crop is marketed and sold for 8d. each. The gross margin per hour is nearly 50s., while the sales per sq. ft of glass are 1s. 2d.

Plant density has a major effect on the profitability of the lettuce crop and plantings at too great a distance are frequently encountered. Many growers plant at 8 in. × 11 in. which, on 1,500 square feet, provides 2,000 plants. At this spacing, with the same proportion marketed and the price as before, the gross margin and profit from the lettuce crop falls by £30.

Many growers have the choice of growing lettuce heated or cold. For a heated lettuce crop to give the same profit as the cold crop illustrated, and assuming £20 is spent on fuel and the same number of heads are sold, then the price has to be 9½d. per head, i.e., 1¾d. up on the cold lettuce price.

## Chrysanthemums

The chrysanthemum crop makes heavy demands on labour, but when good management coincides with good prices this crop can achieve the same profit margin as tomatoes. The work demand of chrysanthemums, and the variable costs and gross margins, are shown in Table 4.

At three blooms per plant, sales from the 1,500 square feet glasshouse should be in the region of £153, which leaves a gross margin of £87. The gross margin would be greater where cuttings are supplied from the holding but the labour requirement would be a little greater. When four or five blooms are taken from each plant, the gross margin increases by £43 (increase in sales of £50 less increase in container cost of £7) with each additional bloom taken, but labour requirements increase by 24 hours for the cutting and boxing of the extra blooms.

Table 4.

## Chrysanthemums

*Labour Requirements for 1,750 plants (5,250 blooms)*

<i>Operation</i>	<i>Man hr</i>
Planting and preparation of nursery bed	10
Hoe, water, weed and pinch tops	6
Digging glasshouse	8
Planting (70 plants per hr)	25
Hoe and water	12
Disbud (twice)	24
Stringing (netting)	8
Stoking (6 weeks @ 3½ hr)	21
Cutting, stand in water and box (3 boxes per hr, 24 blooms per box—218 boxes)	73
Clearing house	10

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197

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<i>Variable costs</i>	<i>£</i>	<i>Returns</i>	<i>£</i>
Cuttings	22	218 boxes @ 14s.	153
Netting (depreciation)	2		
Fertilizer	1		
Fuel (2 tons)	20		
Containers	21		
	<hr/>		
Total variable cost	66		
GROSS MARGIN	87		
	<hr/>		
	153		153
	<hr/>		<hr/>

**Recording is essential**

The standards of performance of these three crops may be taken as a guide for other growers of the crops; they represent the normal achievements of reasonably good growers on holdings of the Land Settlement type. For the individual grower what matters is the result he can obtain from his own crops within the limitations of his own glass. It is essential for such growers to record their own performance. Not only do records serve to spur the grower on to better achievements, but they are of fundamental use in planning profitable cropping on the holding. The examples given are summaries of growers' records and they illustrate the records required.

The basis of recording is one site or group of sites growing the same crop. Entries of three types are made weekly to avoid the work becoming too burdensome. Labour is recorded by operation—hours not the wage rate are required for labour planning. Variable costs are recorded in the week they occur. Finally, records of returns are kept showing the quantity sold, the deductions for market charge, the price and the amount received.

Planning decisions on the individual glasshouse nursery must depend on the circumstances of the individual holding, e.g., the labour available, the presence of casual labour and family labour to help out at different times, the condition of the glass, and the effectiveness of the heating system. The last-mentioned is of real significance in deciding whether heated or cold production of tomatoes, for example, pays the best since the fixed costs of production vary little according to whether a crop is grown heated or cold.

In any event, the position is clearly evaluated by drawing up figures giving the gross margin for each crop in the way illustrated, and the conclusions drawn will necessarily vary according to the individual nursery concerned. So often it is the case that recommendations for increasing profit on one nursery cannot automatically be made to apply to another nursery. Profit maximization so much depends on the resources available and the ability to work within the limitations imposed by them.

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The author of this article, **W. L. Hinton, M.A., B.A. (Com.), N.D.A.**, is Horticultural Management Liaison Officer in the Farm Economics Branch of the School of Agriculture, Cambridge.

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## The Ministry's Publications

Since the list published in the November, 1965, issue of *Agriculture* (p. 568) the following publications have been issued.

### MAJOR PUBLICATIONS

Experimental Horticulture No. 13, October 1965 (New) 8s. (by post 8s. 7d.)

### ADVISORY LEAFLETS

(Price 4d. each—by post 7d.)

- No. 86. Glasshouse Whitefly (Revised)
- No. 227. Mangels and Fodder Beet (Revised)
- No. 244. The Rook (Revised)
- No. 273. Gooseberry Powdery Mildews (Revised)
- No. 297. Sweet Corn (Revised)
- No. 353. Anemones (Revised)
- No. 376. Weed Control in Peas (Revised)
- No. 383. Cockroaches (Revised)
- No. 410. Red Core of Strawberry (Revised)
- No. 430. The Production of Small Roasting Chicken (Broilers) (Revised)
- No. 441. Nitrogenous Fertilizers for Farm Crops (Revised)
- No. 487. Introducing Outdoor Irrigation (Revised)
- No. 494. The Feeding Value of Grass Silage (Revised)
- No. 504. Seed Potato Sprouting (Revised)
- No. 517. Avoiding Losses in Calf Rearing (Revised)
- No. 523. Diseases of Turkeys (Revised)
- No. 525. Feeding Concentrates to Dairy Cows (Revised)

### FREE ISSUES

- STL No. 46. Seeds Mixtures (New)  
(Replaces Advisory Leaflet No. 454—Seeds for Leys)

*The priced publications listed above are obtainable from Government Bookshops (addresses on p. 624), or through any bookseller. Unpriced items are obtainable only from the Ministry (Publications), Tolcarne Drive, Pinner, Middlesex.*

## **35. Alnwick and Morpeth, Northumberland**

**R. G. Tate**

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THE Alnwick and Morpeth district is bounded in the east by 30 miles of North Sea coastline and straddles the A.1, starting in the south at Morpeth and running six miles north of Alnwick to North Charlton.

The gently undulating countryside, exposed to frequent, cold easterly winds off the sea, has a moderate rainfall. Records at Cockle Park, the former Northumberland County Council experimental station which is now owned by the Department of Agriculture, Newcastle University, show an average of 29 inches a year over a period of 50 years. 'Sea frets', caused by low cloud, are common in spring and early summer and enable vigorous grass growth to be maintained, even in dry periods.

Between the A.1 and the coast the farms are mixed, and average 250-300 acres. Fat lamb production from Halfbred ewes is general and the cereal acreage is increasing. Irish cattle are fattened off grass in summer and in yards in winter. Northumbrian cattle grazers have long had a reputation as astute buyers and sellers, with a subtle sense of when to adjust stocking density. Many farmers are now purchasing calves and the Friesian and its crosses are thus gaining access to these traditionally 'Irish' acres. Dairy herds in this area are few and scattered, but quality is not lacking and two of the country's outstanding Ayrshire herds, those of Messrs. A. B. Howie and Sons at Morwick and Messrs. Sanderson at Eshott, have contributed much to breed improvement.

To the west of the A.1 the land rises very gradually in the south, more sharply in the north, and poorer soil and drainage have so far prevented any significant increase in the cereal acreage. Therefore this remains predominantly an area of large grass farms, many carrying suckler herds using Irish (Angus  $\times$  Shorthorn) cows crossed with the Hereford and, to a lesser extent, the Angus bull. There are also large flocks of sheep, many of which are Halfbreds or Mules for fat and store lamb production. In the harsher areas, however, there are some Cheviot or Blackface which produce the previously-mentioned cross-breeds, using the Border and Hexham Leicester ram respectively.

These are the farms which inevitably whet the appetite of those agricultural pundits of the intensive school who so liberally sprinkle the advisory and journalistic field. But, in their large unit size and very low basic costs, these farms embody a fundamental advantage as businesses which is seldom found in the United Kingdom.

The farming here is strongly patterned, with an air of permanence which is emphasized by the substantial stone-built steadings, many showing evidence of fortifications, but it does not go back much farther than the beginning of the nineteenth century. Before that, border raiding precluded the establishment of a settled farming system. Thus, although Northumbrian farming may have a rather staid, traditional appearance to the uninitiated, the farmers are men whose instincts were imprinted by recent forbears, who only survived by flexibility of outlook and strength of arm in an uncertain political and social situation. One is tempted to enlarge on this theme and say that this has prepared them better than most for the rapidly changing situation they face today.

The soils throughout the district are largely derived from boulder clay drift. Diverse in nature, they are predominantly heavy, and rigorous attention to drainage is a necessity. Hence the large acreage of ridge-and-furrow permanent pasture. The heavy nature of much of this land, particularly that lying to the east of the A.1 between Alnwick and Morpeth, imposes a rotational discipline in which the well-managed ley makes an invaluable contribution to maintenance of soil texture.

The northern part of the Northumbrian coalfield is in this same area, with the slag heaps at Ashington, Pegswood and Lynemouth etched, apparently indelibly, on the skyline. Usage for road-making and similar tasks has made little impression on the size of these slag heaps and attempts to apply a mulch, carrying grass seed, organic matter and fertilizer with a rain-gun applicator, are meeting with some success. Though hardly likely to match the dominant splendour of the Cheviot Hills, brooding as they do over the whole county from their commanding situation in the north-west, these man-made alps may offer an unexpected opportunity to goat breeders!

Subsidence from colliery workings, dogs and trespass, make farming in these areas difficult, but the ready market for potatoes, eggs and, in former years, hay for pit ponies, has offered compensations. Having commenced farming in 1863, the Ashington Coal Company was farming 5,690 acres when nationalized in 1947. In 1959 the National Coal Board leased 6,000 acres to Mr. J. L. Rudé, who formed a company, Northumbria Farms Ltd., which this year had over 3,000 acres in cereals.

The castles of Northumberland are one of its most striking features and, together with the large tracts of completely unspoilt and sparsely-inhabited countryside, they attract many tourists. Those at Warkworth and Dunstanburgh are ruins, the latter still adopting a most aggressive pose, situated as it is on a ridge of basaltic rock rising 100 feet sheer from the sea. The castle is only a stone's throw from Craster, a tiny fishing village nationally known for the reputedly unique flavour of the kippers produced there during the herring season.

Inland from Dunstanburgh at Alnwick is another famous castle, the home of the Percy family. Set in a splendid situation overlooking the River Aln, this well-kept castle has been subjected to periodic additions and major modifications, and from here the 10th Duke of Northumberland supervises the administration of the 100,000-acre estate. This is one of the largest in the country, with some 200 holdings of over 50 acres.

If I have conveyed an image of large-scale mixed farming, conducted in a cool, low-rainfall but humid climate—the whole, urban as well as rural, pervaded by a strong sense of history—then I have done to this part of Northumberland such justice as can be done in a short article of this kind.

## **A Single-storey**

# **Hop-drying Building**

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FOR the second year in succession Messrs. H. H. Tompsett and Sons, Ltd., Little Sheephurst Farm, Marden, have dried their hops in the first oast in Kent using a single-storey building.

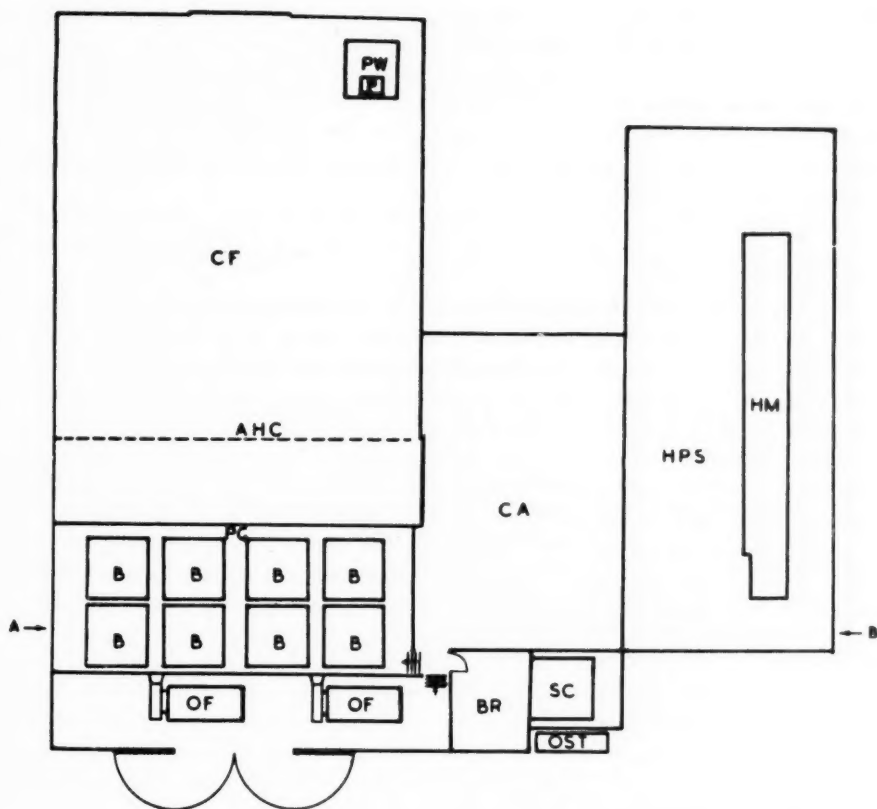
Mr. P. Tompsett, who grows 28 acres of hops at Little Sheephurst Farm, decided when he replaced his old oast-house to cut out the handling of the picked green hops in ten-bushel pokes. He also considered that drying, conditioning and pressing the hops did not need a loft floor but could be carried out at ground level. Moreover, he wanted a building that could easily be used for other general purposes, as hop-drying was confined to a few weeks only each year.

A six-bay steel-framed building, approximately 94 ft  $\times$  50 ft  $\times$  10 – 12 ft to eaves, formed the basic structure, to the side of which was added a lean-to approximately 45 ft long and 30 ft wide to link to the hop-picking machine shed and give a covered working area. At one end another lean-to was built, approximately 10 ft wide, with a 3 ft 6 in. cantilever for the housing of the two oil-fired fan furnaces.

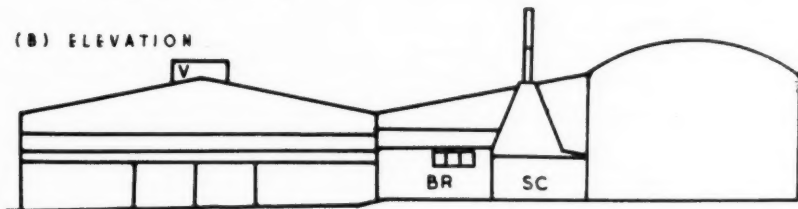
The main building has a low-pitched roof covered with double skin asbestos sheeting incorporating 1 in. of fibre-glass in-fill, with adequate roof lights. Cavity walling is used for in-filling between stanchions. The floor of this building has a polythene damp-proof membrane and a water-proofing agent was also added to the 6 in. of reinforced concrete. These features give some control of environment, which Mr. Tompsett considers desirable for the conditioning of the hops and for any further use to which the building may be put. There are two sets of wide sliding doors and good approaches, to give easy entry for any purpose.

Fig. A shows the layout, and it will be noted that a special bunk-room was added for the comfort of the oast-house crew, as drying is continuous for sixteen hours each day. This room also acts as the control room, with switches and windows at appropriate vantage points. The separate sulphuring chamber has a special exhaust system. This consists of a conical cover with a chimney (see Fig. B) through which the sulphur fumes are forced out by a fan with a velocity that ensures they are adequately dispersed into the atmosphere.

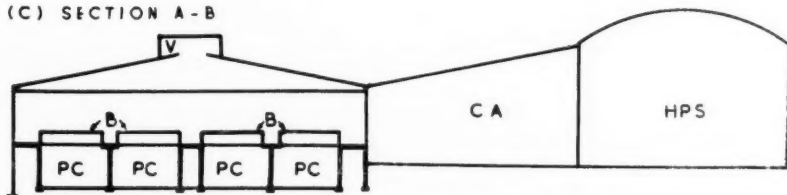
(A) PLAN



(B) ELEVATION



(C) SECTION A-B



HPS Hop picking shed.  
 HM Hop picking machine.  
 CA Covered area.  
 SC Sulphuring chamber.  
 PC Plenum chambers.  
 B Bins  
 AHC Asbestos hessian curtain.

CF Cooling floor.  
 P Press.  
 PW Pocket well.  
 OF Oil fired fan furnace.  
 OST Oil storage tank.  
 BR Bunk room.  
 V Ventilator.

Scale: ft. 0 1 2 3 4 5 6 ft.

The cross-section in Fig. C principally shows the plenum, or drying, chambers and bins in position. The drying area is divided into two plenum chambers each taking four bins. Both chambers are served by an oil-fired fan furnace which ensures that there is a uniform air flow and temperature over each area. In the roof above the bins are two flaps which can be lifted by operating a lever at floor level; these act as the ventilator through which the moisture-laden air passes when drying is in progress. The flaps are protected by a raised flat roof.

Inside the building, the cooling and conditioning floor is separated from the drying section by an asbestos hessian curtain which is easily drawn aside when necessary.

The hops are moved in portable metal bins, approximately 9 ft square and 2 ft 6 in. deep, set on 6 in. castor wheels. After being filled direct from the hop-picking machine, they are first pushed into the sulphur chamber and then into the drying area. The drying pit, which is partly below ground level, has been finished 3 ft above the floor (in some areas site conditions may influence the choice of design) and the bins therefore are lifted, carried and lowered into their respective frames over the plenum chambers. For this purpose block-and-tackle units on trolleys running on overhead rails are used. After the hops have been dried, the bins are lifted and conveyed to where they are tipped on to drag-cloths, which are then pulled from the kiln section into the conditioning area. After a long cooling period, the hops are pressed into 1½-cwt pockets. For this operation there is a well deep enough to take the 6 ft-long pockets; this can be boarded over when not in use. There is ample space for the hop pockets to be stacked awaiting collection by the Hops Marketing Board.

The clear floor area has enabled this building to be used as a store and as a workshop for the maintenance of machinery. This insulated building can be warmed by the fan furnaces so that work is done in comfortable conditions. Mr. Tompsett may take advantage of these good conditions to make further use of the building for grading and packing apples (which are also grown on the farm) to show that careful planning with an eye to the future results in sound investment of capital.

#### INCREASED SUBSCRIPTION RATE

Because of higher postal charges, we regret that the postal subscription rate for *Agriculture* will be increased to £1 1s. per year (£2 2s. for two years) from 1st January, 1966.

Current subscriptions will not be affected until renewal falls due.

The price per copy will remain at 1s. 3d. (by post 1s. 9d.).



## Agricultural Chemicals Approval Scheme

Since the publication of the 1965 List, the following products have been approved:

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#### DICHLORPROP

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Kildip Plus—Agricola Chemicals Ltd.

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#### NONANOL

For the prevention and control of sprouting in ware potatoes stored in buildings.

'I.C.I.' Nonanol—Plant Protection Ltd.

#### METALDEHYDE

\*Doff-Portland Tip Top Slug Pellets—Doff-Portland Ltd., Station Terrace, Hucknall, Notts.

\*The above product is also available on the amateur market and has been approved for use in the garden.

The following changes of company name are also announced:

Crop Protection (Grantham) Ltd. now trade as Cromptex Ltd.

Shell Chemical Co. Ltd. now trade as Shellstar Ltd.

# **IN BRIEF**

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## **Agricultural Marketing Schemes**

The Report on Agricultural Marketing Schemes for the period 1963-1964 has recently been published, after being presented to Parliament by the Agricultural Ministers as required by the Agricultural Marketing Act 1958. These annual reports have to cover all schemes in operation, and also any draft schemes submitted to Ministers in the year under review. They provide a continuous record of the main activities of the marketing boards since 1931 and, for the post-war period, they include some account of the price guarantee arrangements made with most of the boards. Appendices to the reports reproduce the accounts published by each of the boards in their own annual reports, and also give certain basic statistics relating to the schemes. Mention is also made of any reports on the marketing schemes that have been submitted to Ministers during the year by advisory bodies appointed under the Act, in particular the Consumers' Committees and Committees of Investigation.

The marketing schemes dealt with in the latest Report are those for hops, milk (four schemes), wool, potatoes, eggs and tomatoes and cucumbers. No new scheme was submitted during the year. The Tomato and Cucumber Scheme was revoked as the result of an adverse poll of producers; this was the first case of a scheme being revoked when in full operation. Other events of special interest noted in the Report were the decision of the Hops Board to promote an amendment incorporating in the Scheme itself (and so 'expressly authorizing') the detailed agreement with the brewers on which the Board's operations had been based for many years; and the introduction by the Egg Board of its Second Quality Eggs Scheme, about which the Consumers' Committee and the Committee of Investigation for Great Britain later submitted reports to Ministers.

The Report is obtainable from H.M.S.O., price 9s. (by post 9s. 6d.).

## **Pietrain Pigs**

Pietrain pigs made their first public appearance in this country on the Pig Industry Development Authority's stand at the Royal Dairy Show, Olympia, in October. Pure-bred Pietrains, progeny of the stock which PIDA imported from Belgium last summer, were on display. Pietrain  $\times$  Large White cross-breds and pure Large Whites were also shown, and details about weight for age for all three types of pig were available. Carcasses of Pietrains and Pietrain  $\times$  Large White crosses were also on display. Pietrain trials are still in progress at several centres under PIDA's control.

## Standardization for Trees and Shrubs

The first-ever British Standards for trees and shrubs were published by the British Standards Institution on 28th October. The new British Standards (B.S. 3936) specify the essentials of good quality stock.

Two parts of B.S. 3936 have so far been published. Part One covers all ornamental trees and shrubs, including conifers and woody climbing plants, which are to be transplanted and grown for amenity. Part Three specifies quality requirements for fruit trees, bushes, canes and plants which are suitable for transplanting and grown to produce food. Part Two dealing with roses, and Part Four on forest tree nursery stock, are to be published later.

The Standard has been prepared at the request of the Horticultural Trades Association and the National Farmers Union, and is expected to become an essential 'condition of contract' whenever nursery stock is bought and sold. Requirements are specified for origins—not only that the trees and shrubs shall be true to name but also that their horticultural background shall be given if it is relevant. There are also requirements for root systems; for undamaged and pest and disease and weed-free condition; for stating the size of plants and for adequate packaging and appropriate labelling.

B.S. 3936: Part 3: 1965 specifies quality requirements for apple, pear, plum, cherry, peach, nectarine and apricot trees; black currant, red currant, white currant and gooseberry bushes; raspberry, blackberry and loganberry canes, and strawberry plants.

B.S. 3936 Part 1, *Ornamental trees and shrubs*, is available from BSI Sales Office, 2 Park Street, London, W.1, price 7s. 6d. (plus 9d. postage extra to non-subscribers). B.S. 3936 Part 3, *Fruit nursery stock*, is available at 5s. (plus 6d. postage extra to non-subscribers).

## Poultry Health Scheme

The Poultry Health Scheme comes into operation on 1st January, 1966. The Scheme is basically a continuation of the diseases control provisions of the Poultry Stock Improvement Plan in England and Wales and the Scottish Poultry Improvement Scheme (which come to an end on 31st December, 1965), and the objective is to maintain healthy sources of poultry stock to the benefit of both egg and meat producing flocks. Poultry breeders and hatchery owners in Great Britain with a prescribed minimum flock size or incubator capacity, and who meet certain standards required under the Scheme, will be eligible for membership. The main benefits to members will be the free post-mortem service for their flocks and the opportunity to obtain free veterinary advice. Copies of the new Scheme can be obtained from the Ministry of Agriculture, Fisheries and Food, Hook Rise, Tolworth, Surbiton, Surrey, or from any of the Ministry's Divisional Veterinary Officers, who can also supply forms of application for membership.

## Agricultural Aviation

The Third International Agricultural Aviation Congress will be held at Arnhem, The Netherlands, on 14th-18th March, 1966. It is being organized by a committee composed of representatives of the Netherlands government and industry, and the International Agricultural Aviation Centre. Previous international congresses, also held under the auspices of IAAC, were at Cranfield, U.K. (1959), and at Grignon, France (1962). The programme of the Third Congress, details of which have yet to be announced, will include papers on all aspects of agricultural aviation, including forestry, and aerial survey and photography for related purposes. Demonstrations of aircraft and equipment are also planned.

# Books

**Newsom's Sheep Diseases (3rd Edition).**  
H. MARSH. Baillière, Tindall and Cassell,  
1965. 76s.

*Newsom's Sheep Diseases* was first published in 1952 and has enjoyed increasing popularity as each edition has appeared. It has long since established itself as a standard text-book for veterinary surgeons and students, and has now been brought up to date by Hadleigh Marsh without changing the original format.

Its contents are suitably arranged in four main parts: (i) infectious diseases; (ii) parasitic diseases; (iii) non-transmissible diseases; (iv) poisons. These are then presented under appropriate sub-divisions, and finally each condition is discussed under a system of standard sub-headings. The arrangement makes for easy reading and memorizing, and for quick cross-reference for differential or comparative purposes.

More of the excellent photographic illustrations might have been included with advantage (e.g., liver lesion in black disease, intestinal ulceration in lamb dysentery). One is not too happy that the illustration of the lesion of enterotoxaemia is really typical of that condition in this country.

There is an inevitable time lag in the revision of any scientific information, and this revision inevitably suffers some shortcomings. There are omissions of importance to British readers (e.g., toxoplasmosis, cerebral cortical necrosis, border disease). The discussion on fascioliasis seems to dismiss the acute form of the disease far too easily, and no reference is made to the value of hexachlorophene in the treatment of the disease. In the same way no reference is made to the treatment of parasitic pneumonia with diethylcarbazine, a drug showing much promise in this country.

With these few and minor exceptions, this edition retains the previous high standard. It is excellently produced on good paper and will continue to be a 'must' on the shelves of all concerned with sheep diseases.

W.T.R.

**Soils: An Introduction to Soils and Plant Growth (2nd Edition).** ROY L. DONAHUE.  
Prentice-Hall International, 1965. 64s.

This book is an introduction to soils and plant growth. To be valuable as an elementary text, it should adequately cover the subject matter, be clear, precise, and logically arranged. These objectives are particularly difficult to achieve for soils, because their study involves several inter-related scientific disciplines. The usefulness of this book may be judged from how well the author succeeds in these aims.

Dr. Donahue has divided his book into two parts, each of ten chapters. Each chapter ends with a summary and questions for the student to answer. Part I, Fundamentals of Soil Science and Plant Growth, describes soil formation and classification, chemical and physical properties of soils, soil microbiology and plant nutrition. Part II, Soil Science Applied to Problems of Plant Growth, deals with the chemical and physical aspects of fertility (lime, fertilizers and manures, water, and structure), and finishes with descriptions of deficiency symptoms in some crops. The book is completed by four appendices, atomic weight and valence of common elements, conversion factors, verbal definitions of soil textural classes and a glossary of terms.

Written in an American style and idiom, using quite naturally almost entirely American results and experience, the scope of the subject under discussion is occasionally limited. For example, in the section on mechanical analysis of soils only the American system of particle size grading is given; there is no mention of how this differs from the International system. The writing suffers from poor usage and occasional misuse of words, which makes the subject matter more difficult to follow, and some statements lack precision and clarity. Parts of the material do not appear in a logical sequence; for example, the author uses 'exchangeable cations' in describing clays and does not describe 'cationic exchange' until two pages later.

The book is copiously illustrated and the author is to be congratulated on his use of pictures and diagrams to supplement the text—although the quality of reproduction of some pictures is poor. As the book is printed in the U.S.A., it is relatively expensive in the U.K., costing about as much as Russell's *Soil Conditions and Plant Growth*, and having about half the number of pages. And whilst it is useful for those who want to know something at an elementary level of American soils and soil practice, the faults mentioned decrease the value of a potentially valuable book.

J.K.R.G.

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**Shell Treasury of the Countryside.** Edited by JOHN BAKER. Phoenix House, 1965. 6s.

The aim of this small book is to serve as an introduction to England's countryside, its features and its various studies. In this it succeeds.

One can never be quite sure who will buy a particular book; to connect books with their readers often brings a surprise. Presumably this one will be bought and read by people who have just become aware of what our countryside has to offer. Such people may decide, for a start, to look at one particular stretch of country—their own home county or some well-known area of obvious natural beauty. In this case, they will make use of a local guide book. But if they want to take a wider view, and need to have their eyes really opened before they start to travel, this book will suit them.

Nine chapters cover individual topics. These start with a survey of how man has changed our countryside, which is of course the right emphasis, and proceed through brief outlines of geology, archaeology, history, topography, architecture and nature study—in a readable and acceptable guise—to a ten-page summary of modern farming scenes and methods.

There are numerous photographs and plates, a good proportion of them in colour. Although small, they are well chosen and amplify the message in the text. The last few pages are devoted to the 'Country Code', some guidance on the

choice of maps, and information about societies and other bodies concerned with specialist studies and rural preservation.

G.B.

#### Books Received

*The Insects Around Us.* (Rural Education Series). D. M. Ballard. Longmans, Green. 7s. 6d.

*Feeding and Management of Game in Winter.* Eley Game Advisory Service Booklet No. 14. (Available free of charge from the Station at Fordingbridge, Hampshire).

*The Irish Store Cattle Trade.* An examination of the factors influencing exports to the United Kingdom. Marion J. Slattery. Department of Agricultural Economics, University of Bristol.

*Rural Industries Bureau Annual Report, 1964-65.*

*Proceedings of the International Seed Testing Association. Vol. 30. No. 1. 1965.* (Copies may be obtained from the Secretariat, I.S.T.A., Binnenhaven 1, Wageningen, The Netherlands. 12s. 6d. (inc. postage).

*Second Thoughts on Aid.* The theory, problems, practice and future of aid to under-developed countries. B.B.C. Publications. 8s. 6d.

#### ACKNOWLEDGMENT OF PHOTOGRAPHS

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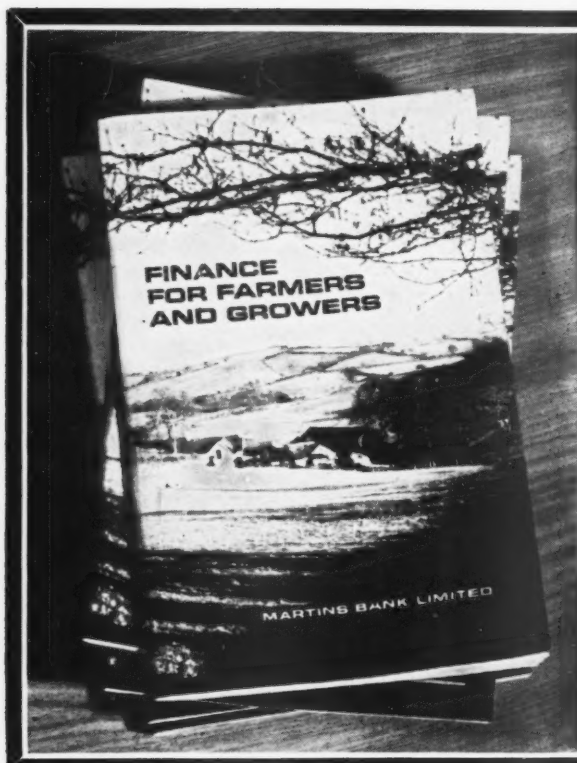
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Issued by the British Insecticide and Fungicide Council, and edited by HUBERT MARTIN, D.S.C., A.R.C.S., F.R.I.C. *Second Edition*, November 1965. 336 pages, 2 illustrations. 32s. 6d.

Of the first edition of this book, now thoroughly revised, *Agriculture* said: 'It is thus an essential tool, the received work, the bible of the pesticide user and, under the editorship of the leading authority on the subject, it is the last word on rates of usage, safety and precautions in dealing with pesticides . . . just the sort of key the intelligent farmer needs.'

### FARM PESTS: An Aid to Their Recognition

by T. E. T. TROUGHT. 1965. 72 pages, 32 colour plates.

12s. 6d.

This little book, which has been produced in co-operation with the Shell Chemical Company, illustrates those insect pests which are of economic importance and common occurrence in farm crops. The various stages of development—egg, larva, pupa and adult—are illustrated together with typical symptoms of damage and notes on the life history of each pest. The book should be an invaluable aid to the farmer in protecting his crops against pest damage, and to the agricultural student as a concise introduction to the subject.

### COTTON PESTS OF THE SUDAN

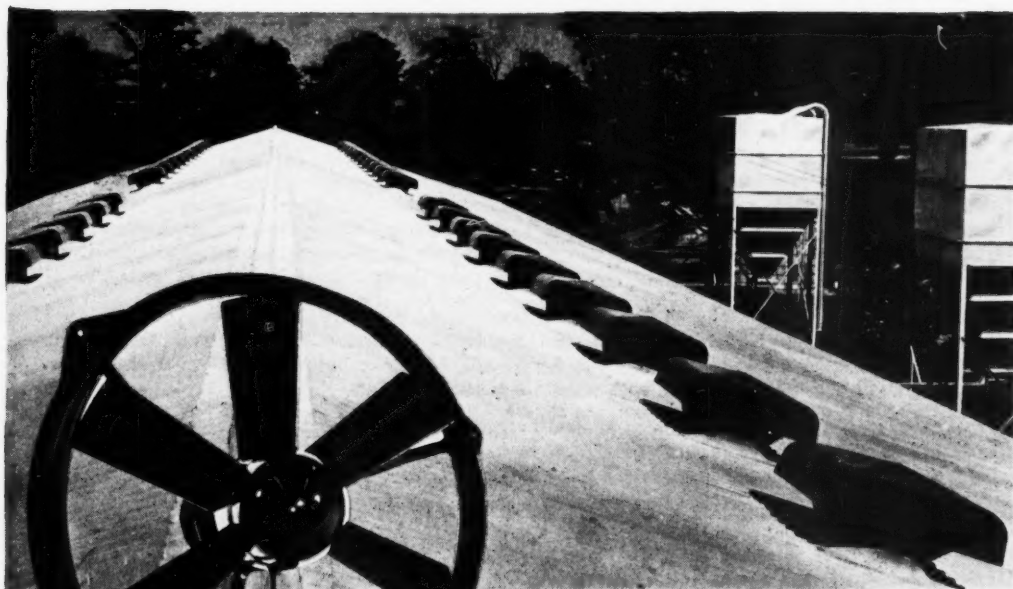
by W. E. RIPPER, PH.D., F.R.E.S., F.R.A.E.S. and LLOYD GEORGE. 1965. 360 pages, 19 illustrations (14 colour).

84s.

The book is a treatise on cotton pests of the Sudan, their life history, damage, natural enemies, economic importance, distribution and control. A description of the pesticides used for control is given, their mode of action, methods of application, side effects, health hazards and precautions necessary for their use, together with the legal background to crop protection and phytosanitation.

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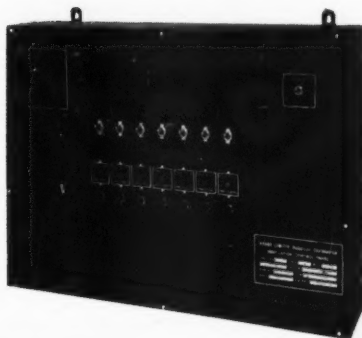


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MINISTRY OF OVERSEAS DEVELOPMENT,  
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